CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the *Chapter 2, Table 1, Action Alternative Comparisons.*

Vegetation

A majority of the Kenney Flats Analysis Area is associated with relatively gentle terrain with slopes of less than 25%. Steeper ground, with slopes ranging from 25-60%, is found in the major drainages of Spiler Canyon, Halfway Canyon and the Blanco River Canyon. Elevations range from approximately 7,000 to 8,700 feet. Ponderosa pine forests dominate the relatively flat areas in the central and northwestern portions of the analysis area, while large stands of Gambel oak dominate the eastern side of the analysis area. Numerous meadows of various sizes are intermixed with the ponderosa pine and Gambel oak stands. Warm-dry mixed conifer dominated by ponderosa pine and cool-moist mixed conifer dominated by Douglas-fir are also present, occurring primarily on the steeper north and west facing slopes around Halfway and Spiler Canyons, and also on the slopes above the Blanco River. There are also a few small patches of aspen in the east side of the analysis area and a small stand dominated by Rocky Mountain juniper in the south portion of the analysis area along Highway 84 (SJNF CVU, 2002).

Human activities and natural disturbances have had an effect on vegetative composition and structure within the Kenney Flats area. Human activities include, but are not limited to, fire suppression, timber harvest, and livestock grazing. Natural disturbances include, but are not limited to, insect and disease outbreaks, wind events, fire, landslides, and ice and freeze damage. The effects of these actions on ponderosa pine, mixed conifer, and aspen throughout the South Central Highlands Section are discussed in the Resource History Section in Appendix A. Specifically in the Kenney Flats Analysis Area, past and present actions influencing vegetative composition and structure are livestock grazing, fire suppression, prescribed fire, timber harvesting, thinning and planting, firewood cutting and gathering of other miscellaneous forest products (post and poles, transplants, walking sticks, etc.).

The acreage of each cover type present in the Kenney Flats Analysis Area is displayed in Table 8. These acreages were determined using the San Juan National Forest “common vegetation units” layer of the geographic information system (GIS) data on the forest, 2002.

Table 1 National Forest System Land Acres by Vegetation Cover Type

Vegetation Cover Type	Percent of Analysis Area	Acres
Barren Ground/Rock	0	14
Riparian	1	119
Grass/forbs	10	1386
Shrub (Gambel oak)	29	4050
Pinyon/Juniper	0.6	90
Sagebrush	0	9
Ponderosa Pine	52	7289
Mixed Conifer (Warm-Dry)	3.8	542
Mixed Conifer (Cool-Moist)	2	282
Aspen	1.6	229
TOTALS	100	14,010

Ponderosa Pine Cover Type

Ponderosa pine forests occupy 7,289 acres, or 52% of the analysis area, dominating the relatively flat areas in the central and northwestern portions of the analysis area. Ponderosa pine is the dominant species in these forests, with Gambel oak being the dominant component of the understory. A variety of herbaceous species are found in the understory. White fir and Douglas-fir are occasionally found mixed with ponderosa pine on cooler, moister sites, while Rocky Mountain juniper can be found on dryer sites.

The current condition of ponderosa pine in the Kenney Flats Analysis Area is the result of fire suppression, past timber harvest, fuelwood gathering, and livestock grazing. In general, timber harvest in accessible pine stands removed most of the large, pre-settlement ponderosa pine trees and snags in the early 1900's, with some reports indicating that 60 – 75% of the original volume was removed. After timber harvest, Gambel oak began to dominate the understory of many pine stands in the analysis area. During this same period, livestock grazing and fire suppression greatly reduced the opportunity for frequent, low intensity fires to burn in the area, and Gambel oak continued to dominate and inhibit pine regeneration in most areas. An exception to the lack of pine regeneration is found in several stands near the top of Spiler Canyon that had extensive regeneration establish around 1919. Early timber harvesting also altered the clumpy nature of the pine stands.

The density of pine stands throughout the analysis area varies. Low density pine stands occur as relatively small stands intermixed with the Gambel oak stands, meadows and the larger, denser pine stands. These stands have basal areas ranging from 50 – 100 square feet per acre, and have canopy covers in the 25-50% range. Medium to dense stands also occur across the analysis area. These stands have basal areas ranging from 100 - 150 square feet per acre. Most of these stands have fairly high canopy cover (60-80%), with a few also displaying lower canopy cover (30-50%). There are very few snags in any of these stands, and very few large, old trees. These stands have higher densities and canopy coverage than would probably be expected under the historic fire regime. On a landscape scale, the pine now occurs as fairly uniform, even-aged forests.

They also lack the clumpy distribution they would have displayed under the historic fire regime and patch size is likely larger.

Image 2 View of a Typical Medium to High Density Pine Stand in the Central Portion of the Kenney Flats Analysis Area

The densest stands of ponderosa pine in the analysis area occur near the end of the Kenney Flats road. The basal area in these stands average 200 square feet per acre, with some stands as dense as 300 square feet per acre.

Image 3 Yellow Pine Kenney Flats

Canopy cover averages around 80%. There is very little pine regeneration in any of these stands due to the dense canopy cover and thick litter layer. These same characteristics limit the amount of herbaceous growth in the understory and the amount of Gambel oak in these stands. As in the less dense stands, there are very few snags, and very little age class diversity, with most trees having established somewhere around 1919. Early timber harvests and livestock grazing, combined with current firewood cutting practices and the lack of fire, have produced dense stands of a younger age class with very few large trees or snags. These pine stands have higher densities and canopy coverage than would be expected under the historic fire regime, and are very homogenous in terms of age and size class distribution.

Some areas as seen in Image 3 that are fairly inaccessible and were not harvested in the early 1900's still retain some large, old, pre-settlement trees. These areas include the slopes above Halfway Canyon and the Blanco River, as well as uplands north of Spiler Canyon and several small drainages scattered throughout the analysis area. Basal areas in these stands range from 100 - 140 square feet per acre. The pine stands accessed from

the Buckles Lake road which were harvested in 1978 also still retain many large, old pre-settlement trees.

Image 4 Previously Burned Pine Stand on Kenney Flats Road

A majority of the pine stands in the main Kenney Flats area were prescribed burned in 1976, and a few were burned a second and/or third time, in 1989, 1999, or 2001. This prescribed burning has reduced ground fuels in these areas, and raised the canopy base heights by pruning the lower branches on the trees, as well as reducing ladder fuels. Stands that have not been burned (mostly around the private land) –have higher amounts of ground fuels and ladder fuels than would have been expected under the historic fire regime. Although prescribed burning has reduced fuel buildups, it has done very little to change the density or other structural characteristics of these pine stands. Please refer to Image 4 for an example of a burned area that did not change the stand structure.

There have been no large scale fires in the Kenney Flats Analysis Area since 1873. Prior to 1873, a landscape scale surface fire was a common occurrence, with a median frequency of 11 years. Therefore, at both the stand and landscape level, ponderosa pine stands in the Kenney Flats Analysis Area are outside their historic range of variability (HRV) in terms of fire return interval (see fire and fuels discussion).

Ponderosa pine stands are also outside their HRV in terms of the number of snags present at both the stand and landscape scale. They also appear to be outside the HRV in terms of age class distribution, with very few late successional stands and very few large, old, trees remaining in the pine stands in the analysis area. Overall stand structure also appears to be outside the HRV with pine stands no longer displaying the uneven-aged structure with even-aged clumps that would have been the norm prior to Euro-American settlement. The lack of fire and removal of much of the pine overstory has also caused an increase in the density and uniformity of Gambel oak, which appears to be outside the HRV on a landscape level. Age class distribution in Gambel oak stands has also changed, with a trend toward increasing amounts of young oak and decreasing amounts of very large oak.

Mixed Conifer Cover Type

Warm-dry mixed conifer dominated by ponderosa pine and cool-moist mixed conifer dominated by Douglas-fir occupies approximately 824 acres (5.8 % of the analysis area). It is found primarily on the steeper north and west facing slopes around Halfway and Spiler Canyons, and also on the slopes above the Blanco River.

About 542 acres of this cover type is in the warm-dry phase. Most of the warm-dry mixed conifer is found on the north facing slopes above Spiler Canyon, and on the north and west slopes above the Blanco River. The remaining 282 acres of mixed conifer in the analysis area is in the cool-moist phase, which is found on the north facing slopes above Halfway Canyon.

The species composition in the overstory of these warm-dry stands is similar to that of pre-Euro-American-settlement stands, but with somewhat higher amounts of Douglas-fir. The amount of Douglas-fir in the mid-story and understory, and the lack of ponderosa pine regeneration, is a much different condition than in pre-Euro-American-settlement times. This indicates these stands are moving outside their historic range of variability in terms of species composition. Stand densities and canopy cover have also increased, compared to pre-Euro-American-settlement times, due to the lack of fire and increase in Douglas-fir.

Increases in Douglas-fir and white fir in the understory of warm-dry mixed-conifer stands create ladder fuels and more continuous fuel layers under the canopy. Ground fuels and duff have also continued to accumulate in the absence of fire.

The cool-moist mixed conifer stands in the analysis area are dominated by white fir and Douglas-fir in the overstory, with occasional individual aspen or small aspen patches. Ponderosa pine is rarely present, most often found along ridges or in more open areas. Regeneration is mostly white fir, with occasional Douglas-fir or aspen regeneration. Ponderosa pine regeneration is almost entirely absent. Species composition in these stands is similar to that seen in pre-Euro-American-settlement stands.

Aspen Cover Type

About 229 acres (1.6% of the analysis area) falls within the aspen cover type. These stands occur as small patches in the eastern portion of the analysis area near the Buckles Lake Road. Many smaller patches of aspen can also be found as inclusions in mixed-conifer and ponderosa pine forests throughout the analysis area. The aspen found in the analysis area appears to be mature to over-mature. Aspen often resprouts following disturbances such as fire, and since landscape level fires were common in the analysis area prior to 1873, it seems likely that there was more aspen, in a variety of age classes, present prior to Euro-American settlement.

Shrub (Gambel Oak) Cover Type

The Shrub cover type that is dominated by Gambel oak comprises 4,050 acres, or 29% of the analysis area. Large, continuous stands of Gambel oak dominate the eastern side of the analysis area. The oak in these stands varies in size, from clumps of large, mature stems in the 6 to 12 inch diameter range, to smaller, young stems between clumps. Occasionally, very large oak over 12 inches in diameter is also found. Canopy cover in these stands averages around 50%. Similar stands also occur on the east facing slopes of Klutter Mountain. Occasional ponderosa pine, Douglas-fir, or Rocky Mountain juniper can be found, as well as patches of dry-site aspen.

Very few studies have been conducted in Gambel oak to determine what the historic fire regime in pure oak stands was prior to Euro-American settlement. However, given that these Gambel oak stands occur in close proximity to ponderosa pine stands that we know burned every 1 to 22 years, and given that many Gambel oak stands occur in

relatively warm, dry areas, it seems likely that Gambel oak stands would have burned more frequently prior to settlement than they have over the past 100 years. Current observations indicate Gambel oak stands often don't burn during the summers of normal years, but will burn in the spring and fall. This indicates a mixed fire regime, with frequencies of approximately every 35 to 100 years. Without fire to periodically kill back the above ground portion of the Gambel oak stems and stimulate resprouting, it is likely that on a landscape level, pure Gambel oak stands are denser and more continuous than they would have been under a historic fire regime. With the increasing density of Gambel oak, it is likely there has been a reduction in the cover of understory grasses and forbs.

Gambel oak is also found as a major understory component in the ponderosa pine forests throughout the analysis area. It is considered a secondary successional stage in ponderosa pine stands, altered by logging for fire.

Gambel oak spreads by means of sprouting and seed dispersal. Seedling establishment is largely dependent on soil moisture availability, and is not common in the geographic range where Kenney Flats is located. Most Gambel oak regeneration is via sprouting, which creates clones, or thickets. The vegetative spread of Gambel oak thickets is 4 inches per year on the average, on sites similar to Kenney Flats. Rapid and extensive sprouting follows top removal. (Clary, Tiedemann, Arthur, 1986).

Gambel oak possesses morphological and physiological adaptations to drought. (Kolb, Stone, 2000) Deep roots, xeromorphic leaves and efficient water transport contribute to effective drought tolerance. Gambel oak places a heavy draw on soil moisture both within oak thickets and in open areas between oak thickets. The increase in the Gambel oak component of the landscape at Kenney Flats has caused additional stress to the ponderosa pine trees, related to competition for water and soil nutrients in the area.

Grass/Forb Cover Type

There is an estimated 1,386 acres (10 % of analysis area) of mountain grassland within the Kenney Flats Analysis Area. This cover type occurs as openings ranging in size from 1/10 acre to 135 acres in forested and Gambel oak dominated landscapes and are scattered throughout the analysis area. Many meadows are dominated by non-native grasses that were seeded into the area during erosion control projects, but some meadows and most forested areas are still dominated by native species. Common herbaceous species include Arizona fescue, Kentucky bluegrass, dandelion, yarrow, cinquefoil, mules ears, mountain muhly, Parry oatgrass, junegrass, bottlebrush squirreltail, mountain brome, needlegrass, pine dropseed, muttongrass, elk sedge, American vetch, lupine, fringed sage, and peavine.

Shrubs, including, black sagebrush, shrubby cinquefoil, and snowberry are present as minor components. Most mountain grasslands in the analysis area function as primary range for permitted livestock grazing.

In the absence of fire, ponderosa pine, juniper, Gamble oak, sagebrush, and aspen are encroaching into the margins of many grasslands.

Wetland / Riparian Plant Communities

The Kenney Flats Analysis Area is located on terrain that varies from flat pine benches to mountain slopes and steeply bisected drainages such as Spiler, Sixhorse, and

Halfway Canyons. The analysis area is bisected by 1st, 2nd, and 3rd order drainages including Spence Creek, Coyote Creek, Boone Creek, and numerous unnamed tributaries. These drainages collect runoff from the surrounding slopes, creating primarily ephemeral to intermittent streams that are tributary to the Blanco and Navajo River watersheds. Some of these headwater areas support discontinuous palustrine wetlands associated with the stream channel itself, along with occasional seeps, springs, and stock ponds. These wetlands are dominated by trees, shrubs, and persistent emergents. Representative species include hawthorn, narrowleaf cottonwood, planeleaf willow, alder, and aspen.

When present, drainage-associated wetlands are typically located either directly in the channel or on the generally narrow fringe between the channel and adjacent uplands. Wetlands are not usually continuous along the channels where they occur, but are generally located in portions of the drainage where the topography is shallower. In general, channels in the Kenney Flats Analysis Area are deeply incised and tend to exhibit gullying and downcutting. The water table in such areas has generally been lowered in drainages subjected to such erosion forces, decreasing the potential distribution and abundance of wetlands.

Noxious Weeds

Ground surveys conducted in October detected the presence of Canada thistle, and musk thistle, in the Kenney Flats Analysis Area. A small population of knapweed is established adjacent to the analysis area. These weeds are established along portions of most roads and especially concentrated in parking areas and campsites along the Big Branch Road (FSR 668). Stock congregation areas (large oak clumps, stock ponds) are surprisingly lacking in weed infestations, suggesting that the primary dispersal agent is recreational use of the area.

Weedy species generally rely on surface disturbance to become established and spread. Historic timber harvests, livestock grazing, and recreational use associated with the road and trail network have provided sufficient disturbance to foster the establishment of weedy species. Recreational use throughout the year provides abundant sources for the introduction of weeds to the analysis area. Vehicles moving from one site to another can be prime vectors for transmittal of weed seeds.

The Pagosa District has an active noxious weed control program. This program incorporates education, prevention, reclamation, mechanical control, biological treatments, and use of herbicides.

Threatened, Endangered, and Sensitive Plant Species

There is no suitable habitat in the Kenney Flats Analysis Area for threatened or endangered plant species, nor is habitat present for those proposed for such listing. According to the 2003 Rocky Mountain Region sensitive plant list, there are nineteen sensitive plant species known or suspected to occur on the San Juan National Forest. Of those, only 5 have potential habitat within the Kenney Flats Analysis Area. These species are listed in *Table 9, List of Sensitive Plant Species with Potential Habitat in the Kenney Flats Analysis Area.*

Table 2 List of Sensitive Plant Species with Potential Habitat in the Kenney Flats Analysis Area

Species	Typical Habitat[1]
Missouri milkvetch (*Astragalus missouriensis var. humistratus)*	Flat, shale meadows and on shallow slpes, including roadsides and other disturbed areas.
Aztec milkvetch (*Astragalus proximus*)	Mesas, bluffs, and low hills in sandy, often alkaline, clay soil in sagebrush and pinyon-juniper. Mancos shale.
Pagosa skyrocket (*Ipomopsis polyantha)*	On rocky, clay soils of Mancos shale, barren shrublands and roadsides, montane grasslands under pine, around 7,000 feet.
Frosty bladderpod (*Lesquerella pruinosa)*	Mancos shale, ponderosa pine, Gambel oak, around 6,800 – 8,000 feet.
Large-flower triteleia (*Triteleia grandiflora*)	Grasslands or sagebrush and p-j woodlands to pine forest slopes and hills.

The landscape within and surrounding the Kenney Flats Analysis Area was reconnoitered by Western Bionomics personnel to determine the habitat suitability for all proposed, endangered, threatened, and sensitive species during the period from October 10 through October 15, 2002. In addition, botanists from the Colorado Natural Heritage Program surveyed the Boone Creek area on June 11, 2001 and the Kenney Flats area on September 7, 2001. Forest Service personnel also surveyed areas accessed from the Kenney Flats roads during April and May of 2002. Both the Valle Seco and Kenney Flats areas were surveyed as part of a grazing allotment EA during June, July, and August of 1995. No sensitive plants were located during any of these surveys.

Vegetation Environmental Consequences

Each alternate way to reduce the fuels buildup and restore the ponderosa pine forest to a self sustaining, fire inclusive habitat type, has associated changes to the physical and biological environment. The environmental consequences section describes those changes.

No Action

Ponderosa Pine Cover Type

Under the No Action Alternative, the current prescribed burn program would continue. However, the existing prescribed burn program is not sufficient to move all the ponderosa pine stands toward a restored condition. Please refer to Tables 3, 4, 5 and 6 that describe the current stand characteristics by treatment unit: trees per acre, basal areas, quadratic mean diameter of the trees and the percent canopy cover.

With only prescribed burning, the current even-aged stand structure would continue. The stands would have very uniform structure, with very little clumpy structure and few openings. There will continue to be higher numbers of trees per acre, on average, than would have been seen under the historic fire regime. With no natural or mechanical thinning of these dense pine stands, competition for water, nutrients and light will continue. The large, old trees will be less vigorous and more susceptible to insect and disease. Very few trees will have the opportunity to develop into yellow pine under these dense, highly competitive conditions. The lack of disturbance, and subsequent exposure

of mineral soil, needed for seedling germination, would continue to hamper ponderosa pine regeneration.

Dwarf mistletoe exists in pockets across the analysis area. The infestation located in the southeast portion of the analysis area, is spreading rapidly, and would continue to spread under this alternative. Please refer to *Appendix F, Kenney Flats Photographs and Simulations,* for images showing this parasite damage.

Mixed Conifer Cover Type

Under the No Action Alternative no management activities are planned for the mixed conifer stands. These stands are generally located on steeper slopes, where accessibility limits management options.

Present trends would continue including increased densities and fuel loading over the next 20 years, assuming there are no crown-reducing disturbance events such as wildfire or beetle outbreak. Regeneration would continue to be scarce and ponderosa pine could eventually disappear altogether from the warm-dry phase. Vertical layering would increase as white fir regenerates in the understory and is not thinned by periodic fire. Increasing canopy closure would also cause decrease in vigor and production of understory herbaceous vegetation.

Cool-moist mixed-conifer stands would continue along their successional paths. Shade tolerant species will continue to be the regenerating species. Canopy closure would continue to increase, creating more horizontal and vertical fuel continuity in these stands.

Aspen Cover Type

No management activities are planned for the limited aspen stands in the analysis area. There may be an opportunity to improve wildlife habitat by increasing the aspen component at some point in the future. Regenerating aspen stands does not meet the intent of fuels reduction and restoration prescriptions, addressed in this EA. Deterioration of aspen stands due to age, disease, windthrow and/or subsequent dominance by competing conifers, like white fir would occur in mature and overmature aspen.

Shrub (Gambel Oak) Cover Type

Prescribed fire activities would continue to be implemented on previously authorized locations within the analysis area. There are approximately 250 acres of Gambel oak that remain to be burned under existing burn plans within the Kenney Flats Analysis Area. In addition, there are a number of acres in the Frio Archuleta Area that would be burned with prescribed fire in the near future. The actual units have not been delineated yet. All previously authorized burning has been completed in the Confar Hill Area.

As on previously authorized burn units, prescribed fires would likely burn in a mosaic pattern, alternately killing back patches of mature oak and stimulating root sprouting, and alternately leaving other patches virtually untouched. The end result in such units would be increased oak productivity, increased horizontal and vertical structural diversity, and a healthy, more vigorous stand of oak.

Barring wildfire, in areas that are not located in previously authorized prescribed fire units, herbaceous plant production and oak sprout production would continue to be less

in Gambel oak stands than would be expected under a pre-European settlement fire regime. Oak would continue to dominate the understory of forested stands and compete with pine for nutrients and water.

If a wildfire did occur, the effects to Gambel oak would vary, depending on fire intensity and frequency. In most situations, Gambel oak resprouts vigorously the 1st growing season following fire. If successive fires occur at this stage, Gambel oak stands may remain in a grass-forb stage for a long period of time. Repeated fires in Gambel oak stands may deplete stored resources of rhizomes and lignotubers. As sprouts continue to grow, natural thinning occurs, adding dead stems to the fuel. Fire occurring at this stage also sends Gambel oak stands back to a seral grass-forb stage. In the absence of fire, Gambel oak stands reach maturity in 60 – 80 years. Fire response in mature stands is similar to that in young poles. A severe fire will recycle the stand, while low-severity fires create openings for resprouts. (Crane, 1982)

However, in the event of a wildfire developing under extreme conditions, much of the Gambel oak in the Kenney Flats Analysis Area would be burned. In these stands, there would be prolific resprouting, with an overall increase in the number of stems per acre, but a decrease in the average size of oak. If stand replacing fire occurred in ponderosa pine dominated sites with an oakbrush understory, oak would likely replace pine as the dominant cover in the aftermath of the fire, perhaps for decades.

Grass/forb Cover Type

Pine encroachment along the margins of open meadows would continue where it is already occurring. Prescribed burning may kill some of the encroaching seedlings, but this will be dependent on timing of burning and fuel conditions around the trees. In the absence of prescribed fire or wildfire, pine encroachment would likely continue on many sites.

Where prescribed fires are implemented in ponderosa pine and oakbrush stands, herbaceous plant production would increase in the aftermath of fire, facilitating an increase in the production of forage for wildlife and livestock. This would help to relieve grazing pressure in grassland areas. However, the currently authorized extent of prescribed fire is limited. In the long-term, forage production in the understory of pine stands, and the extent of grasslands across the analysis area would likely diminish in the analysis area.

Wetland/Riparian Plant Communities

Under the No Action Alternative, wetlands associated with livestock impoundments would continue to exist and mature within the analysis area. However, erosive forces coupled with past human activities have led to degradation and gullying in intermittent and ephemeral stream channels, especially in the Halfway Canyon drainage. Without intervention in the channels where erosion is still active, channeling is expected to continue. This degradation lowers the water table in affected stream reaches, which has eliminated fringe wetland plant communities. In the long-term, wetland plant communities may not reestablish themselves along these channels without treatment.

Noxious Weeds

Noxious weeds are generally opportunistic invaders, which tend to increase in density and abundance under disturbance regimes. In the short and long term, management activities and other human uses in the Kenney Flats Analysis Area would likely continue to function as a vector for weed introductions and dispersal. In the long-term, weed presence within the Kenney Flats Analysis Area would be likely to increase with the continued use of the analysis area.

The previously authorized prescribed fires within the analysis area may create conditions that facilitate the expansion of existing populations of noxious weeds. The Pagosa District would monitor these areas closely for noxious weed invasions or expansions following prescribed fire activities. Newly established or expanded weed infestations would be treated.

Threatened, Endangered, and Sensitive Plant Species

Under the no action alternative, potentially suitable habitat for sensitive plant species is not expected to change in distribution or abundance in the short or long term.

Action Alternatives

Ponderosa Pine Cover Type

Under each of the action alternatives, the same acres would be treated. There would be approximately 3,309 acres of thinning and 237 acres of mowing occurring within the ponderosa pine type. Please refer to the tables in Chapter 2. The significant difference in each instance is the timing and disposal of the large woody materials.

Please refer *to Appendix F, Kenney Flats Photographs and Simulations*, for before and after treatment simulations for various stand structures within the Kenney Flats analysis area, (Images 2.1-2.2, 3.1-3.2 and 4.1-4.2).

The thinning activities would reduce overall stand density and decrease canopy closure in three types of ponderosa pine stands. Large yellow barked pine trees would be favored as leave trees, and where spacing is appropriate, clumps of blackjack pine, which are located in a competitive position to become yellow pine would also be left

Comparatively, Alternative 4 would move the Kenney Flats area toward the restoration goals in the shortest time frame; with mechanical treatments completed within 5 years followed by prescribed burning in years 6 -10 . Alternative 3 would accomplish the same restoration (mechanical treatments and prescribed burning) in 20 years. Alternative 2 is anticipated to move the stands toward restoration within incremental thinnings followed by prescribed burning over 20 years, but complicates the success with heavy fuel loading between prescribed burns and thinnings.

Each of the action alternatives will add fuels to the forest floor. This may potentially increase fire intensity during both prescribed fire and wildfires, following each of the fuels reduction alternatives.

Alternative 2 will have the greatest effect on fire intensity, because heavy fuels are left on site, which will greatly increase the surface fuel load after each treatment. Prescribed fires will be more difficult to implement under these conditions, and the window of opportunity available to implement burns will be shorter under Alternative 2. Burning at

higher intensity will create a more uniform burn pattern and less of a mosaic than under lower intensity. Large, tree form oaks and overstory pine will be more likely to be killed in high intensity burns.

Alternatives 3 and 4 will have lower fuel loading with the heaviest fuels removed from the sites. In these alternatives, prescribed fire will be of a lower intensity and the window of opportunity to conduct burns will be longer. Burning at lower intensity will likely create a mosaic pattern, top-killing much of the Gambel oak in a stand, but also leaving some areas completely unburned or only lighting burned. Large, tree-form oaks would be less likely to be top-killed in a low-intensity than a high intensity fire. There will be less mortality in the pine overstory with a low intensity burn.

Mixed Conifer Cover Type

No activities are proposed in the cool-moist mixed conifer cover type under the action alternatives. 38 acres of thinning treatment is proposed in the warm-dry mixed conifer type with impacts being similar to those described under ponderosa pine.

Aspen Cover Type

No activities are proposed in the aspen cover type under the action alternatives. Therefore, the effects will be the same as described under the No Action Alternative.

Shrub (Gambel Oak) Cover Type

Under all action alternatives there would be 201 acres of mowing and 41 acres of thinning occurring within gambel oak dominated sites.

Under all action alternatives, prescribed fire and/or mowing would stimulate sprouting of Gambel oak after top-kill. Gambel oak regeneration is usually vigorous. Sprouts may be observed within 10 post fire days

In the long term, oak mast production would likely be increased as young, vigorous regenerating oak begin to produce acorns.

Grass/forb Cover Type

Prescribed fire in mountain grasslands at Kenney Flats would increase the nutritive quality of grasses and forbs, along with their palatability, availability, and yield for wildlife and livestock. Prescribed fire would suppress invading oak and pine in grassland areas by killing young seedlings and saplings that have invaded from adjacent oak or pine stands.

Grass nutritive quality, palatability, and availability would be improved because the fire removes dead plant material and improves access to new growth. Nutrients tied up in dead plant matter become recycled into the soil to foster new growth. If soil moisture is adequate, productivity would increase because baring and darkening the soil surface would cause it to warm more quickly and stimulate earlier growth in the spring.

Wetland/Riparian Plant Communities

Since wetlands would be avoided during the layout of cutting units, there would be no impacts to wetlands as a result of the proposed project. Prescribed fires would likely have little to no effect on wetlands as they would be avoided during prescribed burning.

Proposed gully treatments are designed to stop active degradation with check-dams or sediment retention basins. As eroding soils build up behind these structures, the process of aggradation would, in theory, raise the water table adjacent to the drainage in the long term. As a possible result, wetlands may increase in distribution and abundance in drainages affected by gully treatments. At the very least, the gully treatments would prevent future degradation.

Noxious Weeds

The potential exists that the disturbance associated with the operation of equipment would lead to increased expansion of existing noxious weed populations and invasion by new infestations. Prescribed fire in the vicinity of noxious weed infestations may create conditions conducive to expansion of pre-existing infestations. Under Alternative 2, these effects would be potentially the greatest, as the intensity of surface fires would be increased by piled and scattered slash. If surface fires get too hot in the presence of heavy fuels, they may potentially kill underground portions of grasses, forbs, and shrubs, creating ideal conditions for weed invasion or at worst, sterilizing the soil .

Mitigation described in Chapter 2 prescribes monitoring and treatment activities for noxious weeds upon completion of the project. As mitigation measures are implemented, noxious weeds will be monitored, and treated as needed.

Threatened, Endangered, and Sensitive Plant Species

There are no threatened or endangered plant species, nor habitat for such species, known to exist in the Kenney Flats Analysis Area. Consequently, there would be **no effect** to threatened or endangered plants as a result of the proposed project.

Although potentially suitable habitat exists for 5 USDA-FS sensitive plants, there are no populations known to exist within the analysis area. Regardless, impacts would not occur in such potentially suitable habitat, consequently, the Biological Evaluation for this project documented **no impact** for any sensitive plants. The complete Kenney Flats biological evaluation for sensitive plants is on file at the Pagosa Ranger District.

Fire and Fuels

Fire is the primary natural disturbance process that affects ponderosa pine forests. This section will briefly describe historic fire occurrences and stand conditions in the ponderosa pine forests of the Kenney Flats Analysis Area, and effects to fire behavior and stand conditions due to fire exclusion. A more detailed description of the role of fire in ponderosa pine forest is found in *Appendix A, Resource History*.

Historic Conditions

Information on historic fire activity and stand conditions comes from several sources. Accurate records of fire occurrences have been kept on the San Juan National Forest since 1960 to the present. In addition, historic documents such as silvical reports and forest histories often contain records of fire. Tree-ring dated fire histories and stand age structure studies are also used to reconstruct historic fire regimes.

Figure 7, Fires and Acres Burned on the San Juan NF from 1960-2000, displays the number of fires and average acres impacted by fires from 1960 to 2000 across the San Juan National Forest. As this figure shows, over most of this 40-year period, large fires were rare. Recently, however, this trend has changed. Starting in 1994, there appears

to be a trend towards larger fires. In 1994, almost 1000 acres burned. Just two years later in 1996 over 4,500 acres burned, mostly from the Disappointment Fire that burned 3,800 acres. New fire records were set again by the Missionary Ridge Fire that burned over 70,000 acres in 2002 (not found in Figure 7). Historic records indicate that the last comparable fire to Missionary Ridge was the Lime Creek Burn, which occurred in 1879 and it burned roughly 26,000 acres in the spruce-fir north of Durango.

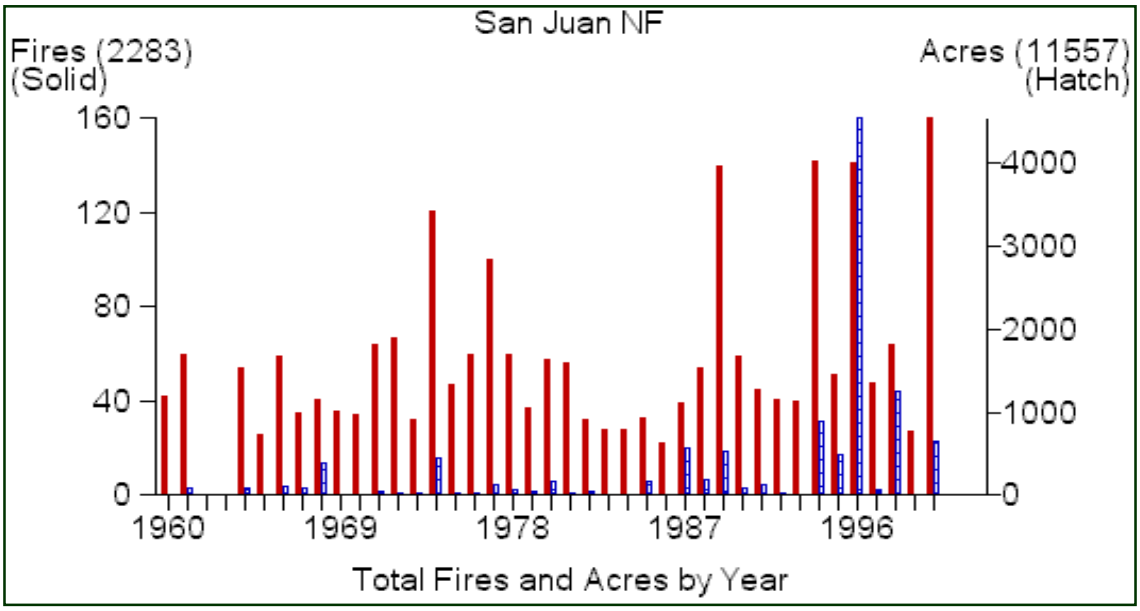


Figure 7 Fires and Acres Burned on the San Juan NF from 1960-2000

Note: Fires are represented by solid bars and acres burned by the hatched bars. From 1960 to 2000, 2,283 fires were reported on the SJNF, burning a total of 11,557 acres.

From 1875 to1994, fires were numerous, but did not get very large because of successful suppression and other human influences such as grazing, road construction, and timber harvesting. Forest records (1960 – 2000) show that dozens of years recorded 40 or more fire starts, and over 100 starts were recorded in 6 of those years.

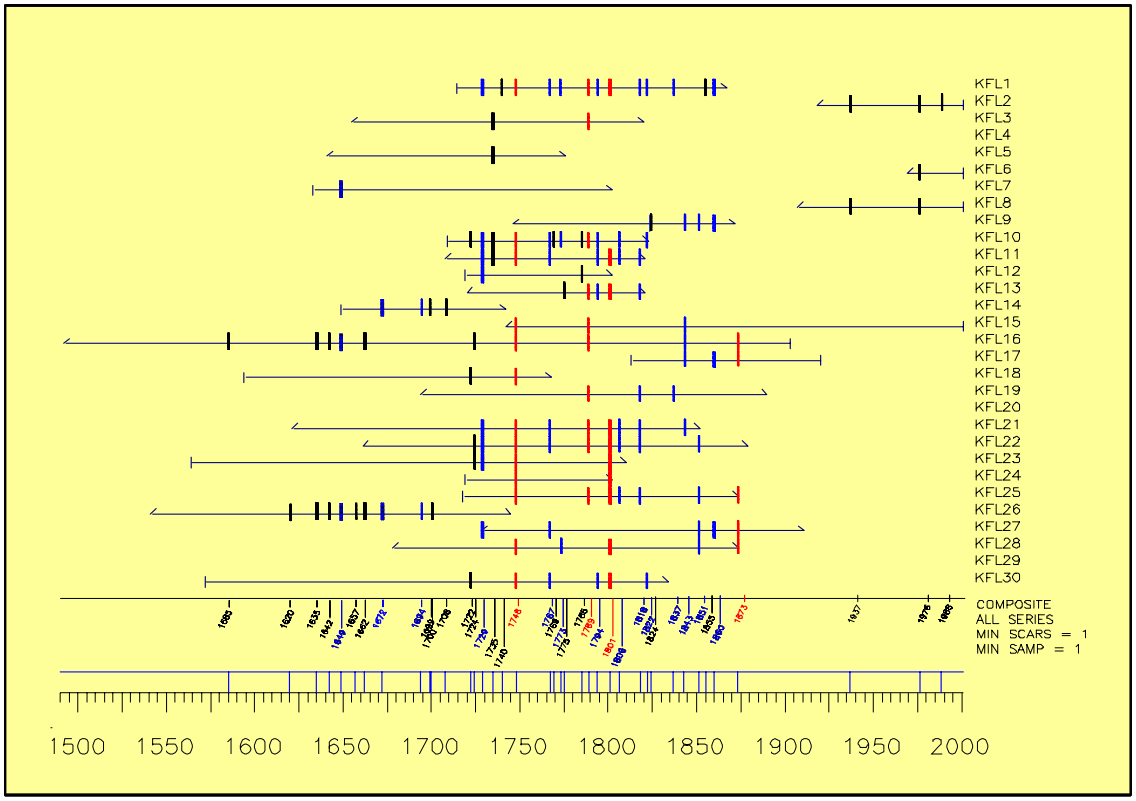
Historic Fire Regimes

In addition to the information contained in historic records, dendrochronological studies (analysis of tree-ring records and stand age structure) can be used to determine historic fire occurrences and fire regimes. Fire regime is a term used to describe typical characteristics of fires in a particular forest type, and its typical ecological effects. Frequency, intensity, size, seasonality, and severity (effects on vegetation and soils) are commonly used to describe fire regimes.

Tree-ring dated fire histories were used to reconstruct historic fire regimes in the Kenney Flats Analysis Area. This information showed that the Kenney Flats Area was characterized by a high frequency, low intensity fire regime in the pre-Euro American settlement period (1585 – 1873). A total of 51 different fire years were found from 1585

to 1873. Some fires were small, scarring only one tree, and some fires were landscape scale, scarring numerous trees across a large area. Tree ring records indicate that a fire of any size, large or small, occurred at intervals ranging from 1 to 35 years with a mean interval of 6 years. Landscape-scale fires were found to occur at a slightly longer interval, with an average interval of 13 years, and ranged in frequency from 4 to 35 years. Landscape-scale fire years occurred in: 1694, 1729, 1748, 1767, 1773, 1789, 1794, 1801, 1818, 1822, 1837, 1843, 1851, and 1860. Many of these fire dates are also found in other parts of the San Juans and the southwest region. *Figure 8 Kenney Flats Fire History* shows the fire history in the Kenney Flats Area.

Figure 8 Kenney Flats Fire History



Fire History Plot. *Each horizontal line represents an individual tree. A vertical bar represents a fire that scarred the recorder tree. Vertical bars that line up across many trees can identify landscape-scale fire years. Fires that scarred at least 50% of recorder trees for that year are noted in red. Fires that did not scar at least 50% but were widely distributed across the Kenney Flats AA are also landscape fire years and are marked in blue. A composite chronology with a time line is at the bottom of the figure, and provides a good visual of fire frequency over time.*

From this data we can conclude that frequent landscape scale surface fires were common in the Kenney Flats area before 1873. There are few natural barriers in the Kenney Flats area to prevent the growth of fires, and undoubtedly, many of these fires burned hundreds to thousands of acres of ponderosa pine. Moisture gradients due to increased elevation, change in aspects, and changes in forest type may have stopped

the spread of fires in normal weather years, but in extreme years, fires would have burned into those areas as well.

Historic Fire Intensity

Pre-European settlement fires were primarily surface fires in the Kenney Flats Analysis Area. The presence of fire scars is the primary evidence for non-lethal surface fire, since only trees that have survived a fire will scar. Large-scale stand replacement fires were not typical in the Kenney Flats Area because the low intensity, frequent surface fires prevented heavy ground fuel accumulations, prevented most stands from becoming overly dense, and prevented ladder fuels from developing across large continuous areas. Thus, landscape-scale stand replacement fires were uncommon in the ponderosa pine fire regime, but low intensity, landscape-scale surface fires were common. Higher elevation areas and north aspects dominated by cool/moist mixed conifer could have supported stand replacement fires.

Historic Fire Seasonality

The time of year that fires occurred is referred to as seasonality and can be estimated by the position of the fire scar within the annual tree ring. In the Kenney Flats Area, the majority of scars (81%) occurred in the earlywood section of the ring meaning fires occurred in early to mid summer in June and July. A large percentage of scars were also found in the dormant position, between annual rings. These scars were assumed to have formed in the spring, probably May and early June, before ring-growth started for the year. A small percentage (19%) of fires occurred in the latewood indicating some fires occurred in August and September. Some portion of dormant scars probably did occur in the later fall during October and November.

Fire Regimes in Other Vegetation Types

Although no data was collected in the mixed conifer stands, other local studies show that its fire regime was mixed, meaning both surface and crown fires occurred (Wu 1999, Romme et al 1999). For Gambel oak sites, fire regimes were likely mixed.

Historic Stand Structure as the Result of Fire

Historic stand structure and composition in ponderosa pine forests is discussed in detail in *Appendix A, Resource History.* In general, frequent, low intensity fires maintained more open conditions in pine stands, creating clumps of relatively even-aged trees interspersed with small openings within the larger uneven-aged forest. Surface fuels were periodically consumed, preventing large buildups of fuel in the understory. Ladder fuels, such as Gambel oak and pine seedlings and saplings, would also have been thinned out on a regular basis, preventing the development of continuous fuel layers into the forest canopy over large areas. Crown base heights would also have been raised by the periodic fires, further reducing ladder fuels.

The forest canopy itself, which is an aerial fuel, would have been less continuous and contained less flammable material because there would have been fewer trees per acre. Therefore, the canopy bulk density, which is the mass of available canopy fuel per unit canopy volume (Scott, 2001), would have been maintained at low levels. There were more large trees, which are more resistant to damage from surface fires. With periodic fires maintaining surface fuels, ladder fuels and aerial fuels at low levels, most fires, even in extreme years, would have stayed on the ground and been low intensity fires,

not stand replacing fires. There may have been some exceptions during these extreme years in areas that supported denser stands of pine, such as drainage bottoms, areas of higher moisture or stands on the leeward side of natural firebreaks such as meadows. Other cover types such as mixed conifer, which has a longer fire return interval, probably also had more intense, potentially stand replacing fires in these extreme years. However, in most years, the fuel characteristics in pine stands allowed for low intensity fires.

Current Conditions

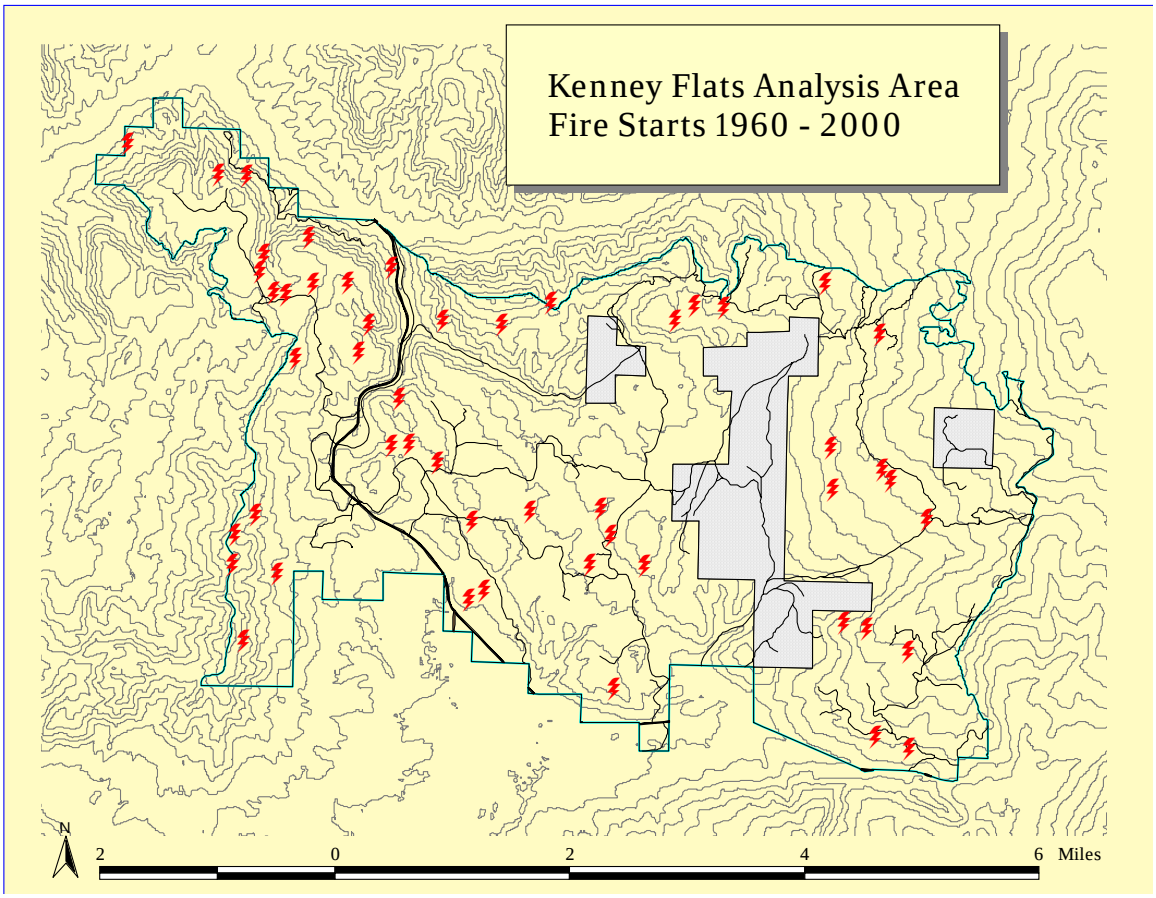
The current condition of vegetation in the Kenney Flats Analysis Area is discussed in the Vegetation section. The Resource History section found in Appendix A also discusses current conditions in the various vegetation types in the analysis area.

Wildfires

Since 1873, the size and frequency of sustained (more than 1 day) fires in the Kenney Flats Analysis Area has dramatically decreased, even though ignitions have been numerous. Forest records show 50 fires were suppressed in the 40 year period from 1960 to 2000. *Figure 9, Kenney Flats Analysis Area Fire Starts 1960-2000*, shows the location of these fires in the Kenney Flats Area. A majority of the fires were lightning ignitions that grew no larger than 0.10 acre because they were suppressed.

The cessation of fire was initially due to heavy grazing that began in the late 1800s and continued through the early 1900s. Fire suppression began in the early 1900s and became very effective after the 1940s. The lack of fire after 1873 is visually obvious in the fire history plot (Figure 8). Fifty-one fire years were identified before 1873 and only five after. The tree ring record also indicates that all of the fires after 1873 were relatively small because they scarred very few trees. Three of the four scars in 1977 appear in areas prescribed burned in the fall of 1976 and the fire in 1988 scarred only one tree. Thus, not only has fire frequency been altered, but typical fire size as well. Small fires have occurred since 1873, but the landscape scale fires that were once frequent have not occurred since 1873.

Figure 9 Kenney Flats Analysis Area Fire Starts 1960-2000



Prescribed Burning

Although wildfires have been aggressively suppressed, the district has been conducting management ignited fires or prescribed burns in the Kenney Flats Analysis Area since the 1970's. Approximately 33 percent (5,164 acres) of the analysis area has been prescribed burned at least once. Of these acres 956 have been burned twice and 599 acres have been burned 3 times. The largest acreage was achieved in the fall of 1976 when about 3900 acres were burned.

Although prescribed burning has been conducted in the Kenney Flats Analysis Area since the 1970's, it has not been able to completely replicate the historic fire regime. The period of time between 1873, when wildfires abruptly stopped; to the 1970's, when prescribed burning began, was a 100 year period in which ground fuels, ladder fuels and crown bulk density were allowed to increase to unprecedented levels. Other stand structure characteristics such as the number of trees per acre, and in some cases, species composition, were also altered during that time by fire suppression as well as timber harvest and livestock grazing. Low intensity prescribed burns have been able to reduce ground fuels, and have had minor success in raising canopy base height and reducing ladder fuels. However, prescribed burning at low intensity has not reduced the number of trees per acre or reduced canopy bulk density, and therefore has not

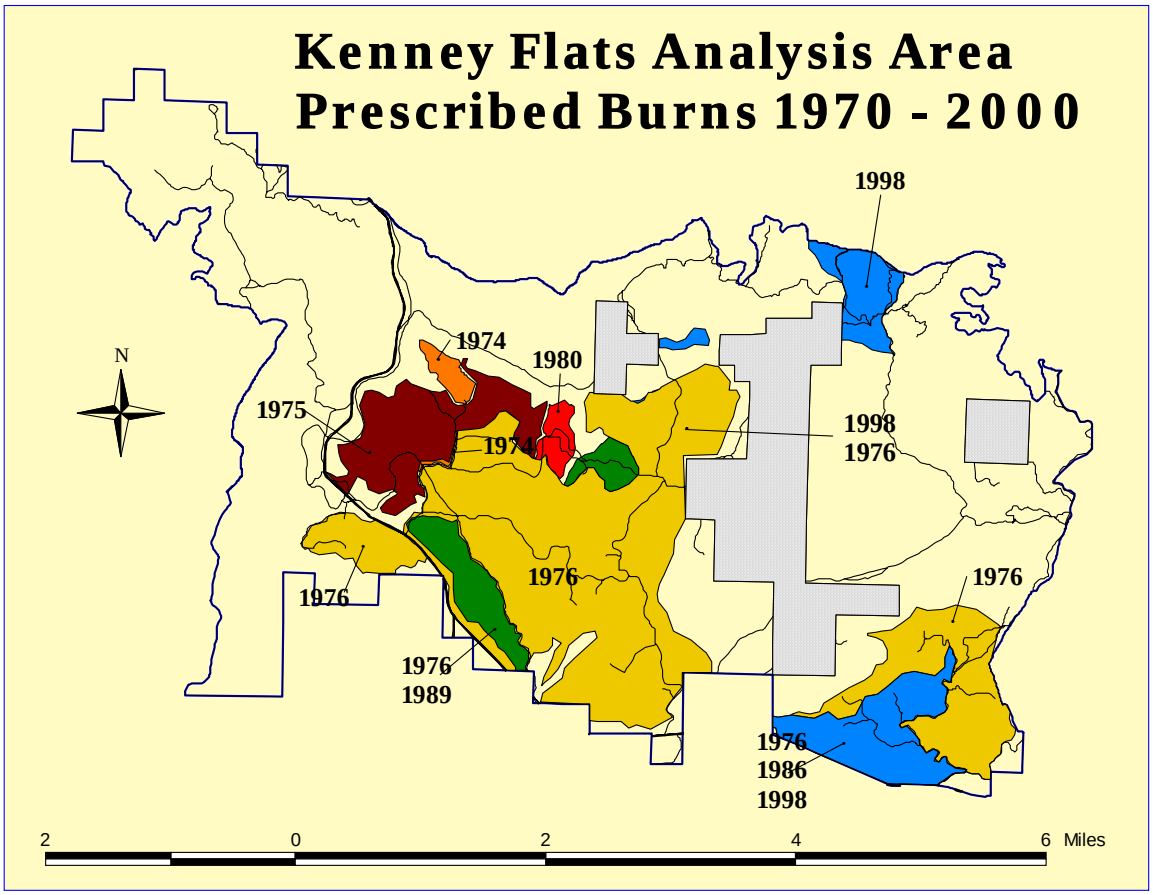
significantly changed stand structure. Therefore, the risk of stand replacing fires occurring in the area is still higher than it would have been historically.

In terms of fire return interval and seasonality, the prescribed burn interval ranged from 1 to 9 years from 1970 to 2000, very similar to the historic fire regime. However, unlike the pre-Euro American settlement period, very few areas have been burned more than once in that time period, and the prescribed fires have been much smaller than the landscape scale fires that once occurred every two decades or so. Prescribed burns in the Kenney Flats Area have been conducted in both the spring and fall. However, no prescribed burns have yet been conducted in the summer, which is when most fires would have burned prior to Euro American settlement.

Condition Classes

Due to changes in stand structure and fuel conditions, there has been a shift in fire regime in much of the ponderosa pine forests from one that supported frequent low intensity fires to one supporting infrequent, high intensity fires. This alteration of the historic fire regime means that most pine stands in the analysis area are within Condition Class 3. Condition Class is a term used to categorize the current condition of a vegetative cover type in terms of its departure from the historic fire regime. The number of missed fire return intervals and the current structure and composition of a stand, as a result of the lack of fire, determine Condition Class. In Condition Class 3, fire regimes have been significantly altered from their historical range and fire frequencies have departed from historical frequencies by multiple return intervals, which can result in dramatic changes to fire size, intensity, severity, and landscapes patterns. The risk of losing key ecosystem components in Condition Class 3 areas is high, because of the potential for high intensity, stand replacing fires to occur. Some stands that have been burned repeatedly and are more open are in Condition Class 2, in which fire regimes have been moderately altered and the risk of losing key ecosystem components is moderate. The fire regimes in other cover types in the analysis area, such as mixed conifer and Gambel oak stands, have been only moderately altered. This indicates these areas are in Condition Class 2. In Condition Class 2, fire frequencies have departed from historic frequencies by one or more intervals and the risk of losing key ecosystem components is moderate. This can result in moderate changes to fire size, intensity, severity, and landscape pattern. Some pine stands that have had numerous prescribed burns are also in Condition Class 2.

Figure 10 Kenney Flats Prescribed Burning



Urban Interface

Much of the private land and many homes in the analysis area are adjacent to dense ponderosa pine or Gambel oak stands. Since these dense stands are in Condition Class 2 and 3 and are capable of supporting crown fire in extreme weather conditions, these private lands and homes are at risk. Even though Gambel oak vegetation types are in Condition Class 2, it historically burned with high intensity every 35 to 100 years, so high intensity fires are not uncommon for this cover type, but they still pose a risk to homes and improvements in the urban interface.

Fire Environmental Consequences

The Farsite fire growth simulation model was used to compare the expected changes in wildfire effects due to manipulation of the fuels in the four alternatives. This modeling is described in detail in *Appendix G, Fire Behavior Modeling Effects* Basically, two scenarios were developed: one which depicts fairly extreme conditions in terms of fuel moistures and weather similar to the conditions present during the Missionary Ridge Fire in 2002, and one which depicts fairly normal conditions. The model then produces maps showing predicted size and intensity of a wildfire if it should occur under those conditions.

Direct and indirect fire effects to fire behavior from the four action alternatives are discussed below. Prescribed fire effects are also discussed. Fire can have immediate

and direct ecological impacts on forest stand structure, in terms of fuel loads and arrangements, age structure, and species abundance. It also may have direct social impacts on human safety and personal property. Indirectly, stand conditions can affect fire risk, and fire itself can affect water quality, wildlife and long-term forest diversity.

In addition to direct and indirect effects, many fire consequences are cumulative, having developed from a combination of management activities over time, such effects are discussed later in the cumulative effects section of this chapter.

No Action

Under the No Action Alternative, no restoration activities, other than previously planned prescribed burning would occur.

The prescribed fires planned in the area will most likely be of low to moderate intensity. In the areas that are burned, these fires will reduce ground fuels and prevent further accumulations of ground fuels. They will also slightly raise crown base heights with every burn. However, low to moderate intensity prescribed fires will have very little effect on the number of trees per acre or canopy closure in these pine stands. So even though ground fuels will be reduced and crown base heights will be raised, crown bulk density will continue to increase as trees grow and continue to accumulate biomass in the crowns. Therefore, prescribed burning alone will do little to effect changes in fire behavior, as compared to Alternatives 2, 3 and 4. There would be no reduction in risk along the wildland urban interface under this alternative.

If a wildfire were to start in a normal year, the Farsite model (see Appendix G for details of modeling results) predicts that there would be very little difference between the no action alternative and any of the action alternatives. This is because fuel loads on the forest floor are not so heavy that crown fires will be easily initiated in a normal weather moisture year.

If a wildfire were to start in an extreme year, however, the model predicts a significant difference in fire behavior between the no action alternative and all of the action alternatives. There would be approximately 3 times more stand replacement fire under no action, as compared to the action alternatives, because it would be much easier to initiate a stand replacement fire during an extreme year under existing dense stand conditions. Though surface fuels are light, a crown fire will carry through the canopy once initiated since crown bulk density is much higher under the no action alternative than under any of the action alternatives.

Prescribed burning has changed the Condition Class of some of the ponderosa pine stands. These stands were fairly open, but had heavy fuel loading that was reduced by burning. These stands were changed from Condition Class 3 to Condition Class 2. Repeated prescribed burning will help move Condition Class 2 areas to Condition Class 1. Fuel loading in other stands currently in Condition Class 3 can be reduced, but they are denser and have high canopy bulk density. Prescribed burning will not significantly reduce density or reduce canopy bulk density, therefore, prescribed burning alone will not change Condition Class in these stands.

Alternative 2

Alternative 2 would involve the treatment of 3,826 acres. Four entries would occur, one every five years over a 20-year period. Each entry would incrementally thin stands over

the 20-year period until desired stand densities, Condition Class 1 or 2 and structures are reached. Prescribed burning would follow thinning. The majority of thinning material would be left on site. Only incidental amounts of firewood and posts/poles would be removed via personal use permits.

This alternative will reduce stand replacement fire risk relative to Alternative 1, since thinning will reduce crown bulk density. However, since most of the material will be left on site, the surface fuel load will increase after each treatment in the short term. So even though the risk of stand replacement fire will be reduced through the reduction of crown bulk density, the increased surface fuels will increase the intensity of surface fires. Stand replacement fire is more likely to be initiated under this alternative as compared to Alternatives 3 and 4 due to the potential increased intensity of surface fire. High intensity ground fires can also cause substantial amounts of scorch and subsequent mortality to the standing pine left in the area. In order to mitigate this effect as much as possible, it is likely that fire managers would chose to burn only in the spring, when large fuels retain winter moisture but fine fuels are drying out. This will help reduce intensities, but will also greatly reduce the window of opportunity for prescribed burning. Multiple, low intensity prescribed burns will also be required to remove the heavy surface fuels so that fires do not burn too hot and sterilize soil. But again, there will be a limited window of opportunity available to burn, so requiring even more burns will add to the difficulty of achieving the target amount of burning. Large amounts of surface fuels over a large area may also inhibit the growth of understory vegetation.

The Farsite model shows that the risk of crown fire during extreme weather conditions would be reduced under this alternative as compared to the No Action Alternative. As compared to Alternatives 3 and 4, however, this alternative creates a situation of prolonged risk and less than optimal conditions to achieve restoration and fuel reduction goals. In addition, if a wildfire started in the area, the increased amounts of ground fuel and higher surface fire intensity would complicate suppression efforts. Higher surface fire intensity often makes it necessary to use indirect attack, as opposed to direct attack. Indirect attack allows a fire to spread unhindered until it reaches a fuel or topography break that will allow successful line construction and holding to stop further spread. It is used when the fire's spread rate is fairly rapid, or when fire intensity is too high for firefighters to make a direct attack. More acres are typically burned using indirect attack, as opposed to direct attack. Direct attack involves treatment of burning fuel at the active edge of a fire in an effort to control the fire. It often involves wetting down or smothering burning fuels, or digging fire line at the edge of the active fire. However, direct attack can only be used when the fires rate of spread is slow and fire intensities are low enough to allow firefighters close access to the fire. This method minimizes the number of acres burned as compared to indirect attack

The treatments proposed under Alternative 2 would eventually change the Condition Class of the treated stands to Class 1 or 2, but the process will be slower for most areas than under Alternatives 3 and 4 and would require multiple prescribed burns to reduce the surface fuels. Given the incremental nature of treatments, there would be no reduction in risk along the wildland urban interface under this alternative until approximately year 15 of the treatment cycle. Given the number of factors that hinder prescribed burn windows and other prescribed burning needs on the District, the likelihood of achieving the Desired Future Condition within 20 years is limited. In the interim the risk of losing key ecosystem components under this alternative is still high.

Desired stand densities would be reached at the end of the 20-year period following four incremental thinning entries. Released trees would then begin to grow into larger diameter classes more rapidly compared to the stagnated stands existing under Alternative 1 - no action. As trees move into the larger diameter classes they would become thicker barked and more resistant to fire.

Alternative 3

Alternative 3 would treat the same (3,826) acres as Alternative 2. However, under this alternative four areas would be prioritized for treatment every 5 years over a 20-year period. Areas were prioritized for treatment based on their proximity to private lands, their stand-densities and fuel-loading characteristics, and their being within Condition Class 3. The entire treatment acreage would be treated by year 20.

Unlike Alternative 2, this alternative would allow for the removal of usable material. Large woody fuels, such as post and poles and small diameter sawtimber would be removed from the site. This would allow for prescribed fire to accomplish the balance of the fuels reduction work.

As in Alternative 2, this alternative reduces tree density, which will reduce crown bulk density. However, it also allows for the removal of material, so there will be smaller amounts of ground fuels as compared to Alternative 2. Less ground fuel means surface fire intensity will be lower, so there will be less scorch and mortality expected and a longer window of opportunity to conduct prescribed burning under this alternative as compared to Alternative 2. It is even less likely that a stand replacement fire would be initiated, even in extreme conditions, as compared to Alternative 2, since both ground fuels and aerial fuels will be reduced.

The Farsite model shows that the risk of crown fire during extreme weather conditions would be reduced under this alternative as compared to the No Action Alternative. Removal of more ground fuel would simplify wildfire suppression efforts as compared to Alternative 2. Direct attack could be used in most situations, as opposed to indirect attack. The areas treated first under this alternative would be along private land, in the wildland urban interface. Treating units adjacent to private lands first will help decrease fire risk for those areas.

This alternative will change areas in Condition Class 3 to Condition Class 1 or 2. It reduces both canopy fuels and ground fuels. Periodic prescribed burning will maintain these areas in Condition Class 1, and help move Condition Class 2 areas into Condition Class 1. The fire regime following treatment will be closer to historic conditions than the current situation. Changes in stand structure and fuel characteristics will bring fire size, intensity, severity, and landscapes patterns more in line with historic conditions. The risk of losing key ecosystem components under this alternative is decreased as compared to the No Action Alternative or Alternative 2. However, it will take a longer period of time to complete this restoration project as compared to Alternative 4.

Desired stand densities would be reached in each of the four prioritized areas at the end of each five-year treatment period. Released trees would then begin to grow into larger diameter classes more rapidly compared to the stagnated stands existing under Alternative 1 - no action. As trees move into the larger diameter classes they would become thicker barked and more resistant to fire.

Alternative 4

Alternative 4 is similar to Alternative 3 in area treated (3,826 acres) and in allowing for the removal of larger thinned material. This alternative would treat all acreage at the end of 5 years.

Alternative 4 would result in a high level of activity in years 1 – 5 where thinning activities would occur. In years 6 – 10, prescribed fire would be used to maintain a restored stand condition. Larger treated material making up various forest products (post & poles, firewood and small diameter sawtimber) would be removed and sold via a number of personal use permits, stewardship contracts and commercial sales of varying sizes.

The results of this alternative would be very similar to Alternative 3. However, the results would be achieved in only 5 - 10 years as compared to the 20 years it would take in Alternative 3.

Like Alternative 3, this alternative will change many areas in Condition Class 3 to Condition Class 1 or 2, and periodic prescribed burning will help maintain these Condition Classes. However, it will take a shorter period of time to complete this restoration project as compared to Alternative 3.

Desired stand densities would be reached over the entire treated acreage within five years. Released trees would then begin to grow into larger diameter classes over the entire area sooner compared to Alternatives 2 or 3 and more rapidly compared to the stagnated stands existing under Alternative 1 - no action. As trees move into the larger diameter classes they would become thicker barked and more resistant to fire.

Air Quality

The Clean Air Act of 1990, as amended, provides the Forest Service the authority to protect air-quality-related values in Class 1 areas. For the San Juan National Forest, the values to be protected are any wilderness component in a Class I area (Weminuche Wilderness) that can be modified by human-caused air pollution. It should be noted that the South San Juan Wilderness, which lies to the east of the Kenney Flats Analysis Area, is classified as a Class II area, nonetheless, the Forest Service is concerned about air quality in this area. The air quality of the analysis area is considered good and the area is in compliance with the National Ambient Air Quality Standards (NAAQS). Pagosa Springs is approximately 12 miles north of the analysis area and is now classified as an air quality maintenance area. The Clean Air Act provides the legal and regulatory framework to protect National Forest System land from impacts related to air quality degradation.

The *Amended Land and Resource Management Plan for the San Juan National Forest* (Forest Plan) requires that wilderness areas be managed to “Protect air quality related values from adverse impacts from air pollution” (USDA Forest Service, 1992). This is accomplished, in part, through compliance with the Clean Air Act.

For all prescribed burns, the Forest Service will obtain the required permits from the Colorado Department of Health and Environment.

No Action

Smoke from pre-authorized prescribed burns will affect local air quality during burning. Past experience burning in the Kenney Flats area indicates that smoke typically vents to

the northeast, but does not go north of the Blanco River and so does not impact Pagosa Springs. Smoke may reach the South San Juan Wilderness, however it would be well dispersed and not long lasting. Less smoke will be produced under this alternative than the action alternatives due to fewer acres being burned. Smoke will likely impact private land within and adjacent to the analysis area.

Action Alternatives

Greater amounts of smoke will be produced under all action alternatives than the no action alternative due to more acres being burned. The greatest amount of smoke will be created under Alternative 2 due to the higher amount of slash left on the ground to be burned and the need to burn each acre four times over a 20-year period. Alternative 3 will produce the least amount of smoke of the three action alternatives because some of the wood will be removed from the site and the burning will occur over a 20-year period. Alternative 4 will produce an intermediate amount of smoke. Although smoke is reduced by the removal of some of the wood from the site, since all burning occurs over a 5-year period, a greater number of acres would be burned per year.

Smoke from prescribed burns will affect local air quality during burning. Past experience burning in the Kenney Flats area indicates that smoke typically vents to the northeast, but does not go north of the Blanco River and so does not impact Pagosa Springs. Smoke may reach the South San Juan Wilderness, however it would be well dispersed and not long lasting. Smoke will likely impact private land within and adjacent to the analysis area.

Soils

Baseline information used to characterize soils was derived from a document entitled *Soil Survey of Piedra Area, Colorado* published by the Natural Resources Conservation Service (Bauer 1981). Information reviewed for the following discussion included soil map unit descriptions, soil interpretation discussions and tables, as well as maps produced to support the soil survey.

Soil map units included within the analysis area are depicted on *Figure 11 Soils Map with Treatment Units.* Pertinent soil characteristics of the soils on site are presented in Table 3*, Pertinent Soil Baseline Characteristics and Interpretations for Soil Map Units to be Impacted.*

Soils and Geologic Parameters

A variety of soils occur across the proposed treatment units for all proposed alternatives. This soil variability stems primarily from a variety of parent materials influenced by topography, aspect, elevation, vegetation, and differential rates of mineral weathering. These soil development components also govern, at least in part, the potential responses of soils to erosion and mass movement (landslides). They are also influential with respect to susceptibility to compaction and soil productivity.

The soils of the proposed area of impacts are developing on a variety of slopes ranging from 4 to 65 percent. Slope increments of from 4 to 25 percent are most common. The dominant parent materials of the soils proposed to be affected include interbedded shales and sandstones and residuum and alluvium developing from sandstones. Mixed landslide materials derived from quartz lattite and igneous rocks overlying shales and sandstones are also common on a more localized basis.

The soils are typically moderately deep (40 to 60 inches) to deep (60+ inches). Soil textures are somewhat variable with loams and silt loams dominating the "fine earth fraction" of the surface soil layers. Clay content typically increases with profile depth with clay loams, sandy clay loams, and clays common to subsurface horizons. Moderate to high coarse fragment contents (gravels, cobbles, stones) may be found in lower soil profile layers but are lacking in most surficial soil horizons. A duff or litter layer is common to several map units and may range from 1.0 to 4.0 inches thick. The pH values of the dominant soils are highly variable ranging, across the analysis area, from 5.1 to 8.4. Value ranges between 5.6 and 7.8, however, are most common. Runoff potential is a main factor contributing to erosion potential and associated soil characteristics related to revegetation/reforestation. Runoff potentials range from "slow" to "very rapid" and are a primarily a function of slope as influenced by soil texture, plant cover, and other factors. Soil map units having slopes ranging from 4 to 25 percent typically have been accorded ratings of "slow" to "medium" with "medium" to "rapid" ratings common to soils on slopes over 25 percent. Erosion hazard ranges from "slight" to "very high". As for runoff potential, this hazard rating correlates overall with slope percentages with the steepest slopes exhibiting "moderate" to "high" ratings and the more gently sloping units being rated as having a "slight" to "moderate" hazard. It can also be noted that many of the steeper map units are subject to mass movement or landslides.

Soil map and interpretations regarding runoff potential and erosion hazard are respectively presented in Figure 11 and Table 3*: Pertinent Soil Baseline Characteristics and Interpretations for Soil Map Units to be Impacted*.

Figure 11

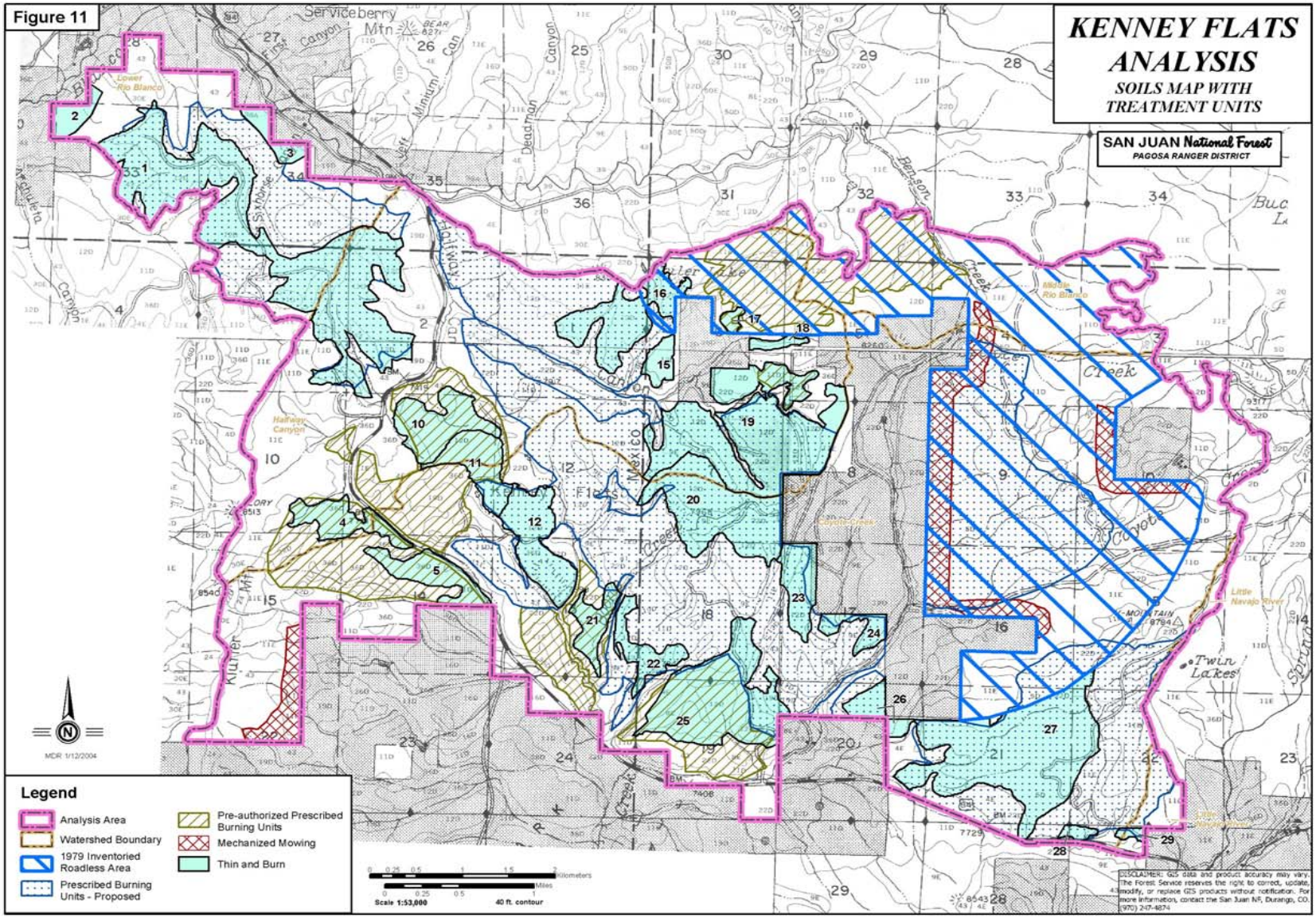

KENNEY FLATS ANALYSIS
SOILS MAP WITH TREATMENT UNITS
SAN JUAN National Forest
PAGOSA RANGER DISTRICT
Legend
Analysis Area
Watershed Boundary
1979 Inventoried Roadless Area
Prescribed Burning Units - Proposed
Pre-authorized Prescribed Burning Units
Mechanized Mowing
Thin and Burn
Scale 1:53,000
40 ft. contour
MDR 1/12/2004
Serviceberry Mtn
Twin Lakes
Halfway Canyon
Little Navajo River

Table 3: Pertinent Soil Baseline Characteristics and Interpretations for Soil Units to be Impacted

Map Unit #	Map Unit Acreage	Slope (%)	Depth	pH Range	Surface Texture	Runoff Potential	Erosion Hazard	Landform	Revegetation Limitations
4E	5.9	25 - 65	shallow	5.6 - 7.8	loam	very rapid	high	sideslopes of valleys, canyons	droughtiness, fertility
5D	607.8	4 - 25	deep	5.1 - 6.0	loam	medium	slight	Landslides	stability
8E	93.8	25 - 65	deep	5.6 - 7.3	gravelly loam	rapid	moderate	canyon slopes	runoff, stability, droughtiness
9E	360.2	25 - 65	deep	5.6 - 7.3	gravelly loam	rapid	high	canyon slopes	runoff, stability, droughtiness
11D	428.9	4 - 25	deep	6.1 - 7.8	silt loam	slow - medium	slight - moderate	Mesas	precipitation, clayey subsoil
11E	252.5	25 - 65	deep	6.1 - 7.8	silt loam	medium	high	Mesas	precipitation, slope, clayey subsoil
12D	2263.0	4 - 25	moderately deep	5.6 - 7.3	loam	medium	moderate	mesas and cuesta dip slopes	clayey subsoil, depth to bedrock
19D	91.8	4 - 25	deep	6.1 - 7.3	loam	slow	slight - moderate	valley toe slopes	none
20	0.6	varies	deep	NI	organic matter	very slow to pond	slight	bottom lands	wetness, flooding
22D	133.9	4 - 15	deep	5.6 - 7.3	clay loam	medium	low - moderate	fans and toe slopes	compaction potential
24	3.3	varies	shallow to moderately deep	NI	50 - 90 percent igneous outcrop	medium	high	ridgetops, valley sideslopes	droughtiness, stability, slide potential
30E	86.0	25 - 65	moderately deep	5.6 - 7.8	silt loam	medium	high	mesas, hogbacks, valley sides	precipitation, windthrow, competition
36D	91.8	4 - 25	deep	6.6 - 8.4	loam	medium	moderate	alluvial plains, piedmonts	potential for gully erosion, precipitation
41	2.9	varies	shallow	NI	rock débris	NI	assume low	Steep cliffs, alpine ridges, valleys	lack of soil
43	535.6	varies	shallow to moderately deep	NI	50 - 90 percent hard sandstone	rapid - very rapid	moderate - very high	cliffs, hogbacks, cuestas, mesas	rock outcrops, lack of soil, erosion potential

A variety of revegetation (or regeneration) limitations are common to many of the soil map units overlying the analysis area. These limitations include runoff potential, droughtiness, stability, clayey subsoils, lack of precipitation, and slope steepness (erosion potential). Other limitations such as depth to bedrock, compaction potential, and windthrow are more map unit-specific in nature.

Soil Environmental Consequences

No Action

Under the No Action Alternative, the soils in the analysis area would remain in their endemic state supporting current land uses. Natural erosion would continue at the same rate that currently exists so long as the soils remain essentially undisturbed. The current grazing program would also continue, as would firewood gathering. Impacts to soils as a result of these activities are considered to be minimal.

A total of approximately 1,986 acres of soils would be subject to the effects of prescribed burning activities for the Kenney Flat and Benson Creek areas. Given that the prescribed burns are designed to be low severity underburns and will be conducted in accordance with Watershed Conservation Practices Handbook practices, it is reasonable to assume that the impacts to soils would be minimized.

Alternative 2

Little soil would be exposed as a result of the tree felling and mowing activities proposed. Therefore, soil erosion and compaction stemming from thinning and mowing is not of concern under this alternative.

The impacts of the broadcast burning treatment proposed for this alternative, given potential fuel volume variability, is uncertain at this time. Where the volume of trees to be felled is low in any one area, the fuel volume produced will be low and the burn severity will likely be low with limited direct impacts to soils. Where the volume of trees to be felled is high, with a correspondingly larger volume of fuels to be disposed of, the burn severity could range from moderate to high resulting in a loss of ground cover and propensity for the development of hydrophobic soils and the tenet impacts of increased runoff, erosion, and reduced productivity. These impacts would be exacerbated on soil map units characterized by steeper slopes and higher inherent erosion potentials (map units 4E, 9E, 11E, 24, 30E, and 43).

Specific Gambel oak stands would be mowed and burned to reduce the threat of an unnaturally intense fire event by reducing the fuel load. Following mowing, the residue would be burned in most of the treated areas to consume the chips. Mowing of ponderosa pine and Gambel oak can produce phenols and tannins that, through weathering, can enter the soil system. While the effects of increased tannin concentrations is uncertain, it is known that an increase in phenol soil concentrations can lead to toxic growth medium conditions and a reduction in plant establishment and/or growth (DeByle 1979). It is assumed that burning the woody residue will cause the phenols along with the tannins to be either volatilized, consumed, or otherwise rendered non-toxic. As a result, no impact to soil productivity is anticipated as a result of tannin or phenol weathering in units that will be burned following mowing. Reestablishment of vegetation (other than oak sprouts) and soil productivity may be reduced in the short term in units that will not be burned following mowing. Understory monitoring has been conducted in mowed units in the Turkey Springs Area. Thus far,

there has been no reduction in growth and a notable increase in the variety and density of wildflowers and grass/forbes than previously existed in these treated areas.

Alternative 3

Under Alternative 3, ground-based, or tractor logging results in a comparatively high degree of surface disturbance to areas subject to equipment traffic and log skidding. Overall, approximately 3 to 5 percent of each unit subject to this logging method will be affected by skid trails with the upslope skid trail length reaching 1,000 feet. Average yarding distance is estimated at approximately 300 to 400 feet. The passage of equipment over the site compacts the soil with the affects of compaction increasing with an increasing number of passes. Equipment passes and associated disturbances will disrupt the litter and duff layers leading to increased erosion potential where equipment is used.

Logs are skidded, after felling, essentially perpendicular to the slope angle and drawn to a central skidding zone where they are drawn up the slope to a yard or load-out area. Initial skidding perpendicular (or near-perpendicular) to the slope breaks the slope length and does not increase the erosion potential to any notable degree. Conversely, when logs are skidded upslope parallel to the slope angle, erosion potential is increased forming a down-slope channel where water can be concentrated and overland flows increased leading to a higher erosion potential. In addition, a small area of soils are compacted as logs are skidded to the landing/load-out areas. Since fewer logs are skidded over the cross-slope skid trails, compaction is comparatively less severe. As the number of logs skidded increases, in association with the upslope skid trails, compaction increases thereby increasing down-slope flows and erosion potential. In addition, revegetation potential is similarly decreased due to the affects of compaction on skid trails.

Landings or yards can be sources of erosion and disturb approximately ¼ acre on average. Landings are also subject to compaction through time as logging activity and tree yarding are completed.

Two types of road disturbances are proposed as a part of one or more of the action alternatives. Temporary roads are short roads used to access treatment units. Existing non-system roads will be upgraded and repaired and approximately 3.5 miles of temporary roads will be constructed. All temporary roads will be rehabilitated after log haul-out is completed. No new permanent access roads will be. Road repair and construction grading will increase the erosion potential of the soils affected. Erosion potential would then decrease as designed drainage facilities take affect. This is particularly true for cut in-slope and fill out-slope disturbances and the down gradient along the road surface itself. Soil compaction will also occur along the road surface in association with equipment traffic.

Although harvest operations will impact the soils, as noted above, it is assumed that the overall impacts to the soils resource will be limited in any one year. While harvesting can occur on slopes up to 35 percent, the majority of activity will be limited to slopes in the range of 4 to 25 percent. The soils typically overlying these slope angles (map units 5D, 11D, 12D, 19D, and 36D) exhibit slow to medium runoff potentials and slight to moderate erosion hazards. In addition, these soils are typically moderately deep to deep

and should retain their inherent productivity potentials due to the overall limited percent of harvest acreage directly impacted by harvest operations.

Less woody material will be left on the ground under this alternative than under Alternative 2. Thus, broadcast burning following logging will likely be lower severity. Therefore, the potential impacts related to the loss of ground cover, the creation of hydrophobic soils, increased runoff, and decreased soil productivity are essentially moot. Burning the slash, litter, and vegetation would quickly cycle nutrients resulting in a potential increase in soil productivity. Exposure of mineral soil is expected to be minimal since the majority of slopes range from 4 to 25 percent and understory vegetation has the propensity to recover from the burn comparatively quickly under low severity fire conditions (Olsen 2003).

Mowing and burning of oak brush treatment areas will take place in the same manner, over the same acreage, as for Alternative 2. Therefore, there is no difference in impacts associated with this activity between Alternatives 2 and 3.

Alternative 4

Under Alternative 4, all logging and fuel treatment activities will be completed utilizing a "one entry" or "landscape level" approach. All treatment units will be impacted simultaneously, as opposed to the phased approach of Alternative 3, and will be completed within 5-10 years (includes mechanical treatment and prescribed buring), as opposed to the 20-year time span of Alternative 2. A total of 3,826 acres would be affected. Merchantable tree removal will be completed as a function of commercial logging contracts using ground-based logging methods. Felled trees will be removed and the slash and other logging residue burned immediately following logging. Logging methods to be used mimic those of Alternative 3. Existing non-system roads will be upgraded and repaired and approximately 3.5 miles of temporary roads will be constructed. All and temporary roads will be decommissioned and rehabilitated after log haul-out is completed. No new permanent access roads will be constructed under this alternative.

Impacts to soils as a result of logging and broadcast burning will be essentially the same as for Alternative 3 except that they will take place over a much shorter time period. As a result, erosion will also theoretically occur over a shorter time period concentrating these effects and leading to a higher potential for stream sedimentation. With larger continuous areas of potentially bare soils, the runoff potential and soil erosion hazards are correspondingly increased as compared to Alternatives 2 and 3.

Mowing and burning to be completed on oak brush treatment areas will take place in the same manner, over the same acreage, as for Alternatives 2 and 3. There is no difference in impacts associated with this fuel treatment activity between any of the action alternatives.

Watershed

The Kenney Flats project area is located within the Rio Blanco and Navajo River 5th level hydrologic units (HUs). A hydrologic unit is defined as an area of land upstream from a specific point on the stream (designated the mouth) that defines a hydrologic boundary and includes all of the source areas that could contribute surface water runoff directly and indirectly to the designated outlet point. The project area overlays five 6th level HUs; the Middle Rio Blanco, Lower Rio Blanco, Halfway Canyon, Coyote Creek and Little

Navajo River. Middle Rio Blanco, Lower Rio Blanco and Halfway Canyon are tributary to the Blanco River and Coyote Creek and Little Navajo River are tributary to the Navajo River. The Blanco and Navajo Rivers are tributary to the San Juan River. *Figures 3, 4, 5 and 6 Action Alternatives Maps,* show the locations of 6th Field HUs in relation to the proposed treatment areas for each alternative. Table 4*, Watershed Sizes* displays the acres within each watershed.

Table 4: Watershed Sizes

Coyote Creek	28,754 acres (44.9 sq mi)
Middle Rio Blanco	19,632 acres (30.7 sq mi)
Little Navajo River	15,025 acres (23.5 sq mi)
Lower Rio Blanco	11,711 acres (18.3 sq mi)
Halfway Canyon	4,057 acres (6.3 sq mi)

Watershed Description

Elevations range from approximately 12,030 feet above the headwaters of the Little Navajo River to approximately 6,630 feet where the Rio Blanco enters the San Juan River. The analysis area watersheds are oriented to the west, southwest, and south. Hillslopes are generally gentle (less than 25%) in most areas, while they are steeper (25 to 60%) in much of the lower Rio Blanco watershed, the western portion of the Middle Rio Blanco watershed, and the headwaters of the Little Navajo River. Conifers dominate most areas within these five watersheds, with numerous open grassy parks also present. The upper third of the Little Navajo river watershed and 109 acres of the Middle Rio Blanco are contained in the South San Juan Wilderness area. Cattle and sheep grazing have occurred throughout the area either in the past or at present. Timber harvest and road building has occurred in portions of all of the watersheds, although very little timber harvest has occurred in the Little Navajo River watershed. Timber harvest, grazing, and residential development have occurred on private land in each watershed. Areas dominated by spruce fir and some mixed conifer areas have a historic fire regime of infrequent but high-intensity fires. In addition, much of the ponderosa pine and some mixed conifer forest are currently at higher risk of severe wildfire due to unnaturally high fuel concentrations as a result of a century of fire suppression. Severe wildfires are possible in any of these vegetation types, and could cause dramatic increases in runoff and erosion up to ten times pre-fire levels.

The closest climate station to the Kenney Flats Analysis Area is in Pagosa Springs at 7,143 feet elevation. Weather data has been collected at this station since 1906. Average annual precipitation is 20 inches and is distributed fairly evenly throughout the year with slight peaks during the summer-fall monsoon and winter snowfall periods (Western Regional Climate Center, 2002). The mean snowfall at Pagosa Springs is 102 inches with the majority of that falling in December and January. Rainfall and snowfall increase as elevation increases toward the eastern portions of the watersheds. Extreme precipitation events occur during the late summer and fall during the monsoon period. For example, the greatest one-day maximum precipitation occurred October 5, 1911 when 3.67 inches of precipitation fell. Some of the biggest floods on record in the southwest have occurred in the fall.

Gaging stations are located on the Rio Blanco and the Little Navajo River. Large water diversion structures exist on the Rio Blanco and Little Navajo River. These diversions, significantly modify the hydrographs. Discharge data was collected on the Rio Blanco above where the diversion structure now exists from 1935 to 1971; below the Rio Blanco diversion dam from 1971 to 1998; on the Little Navajo River below the Lower Oso diversion dam from 1970 to 1996; and the Little Navajo River near Chromo from1935 to 1952 (USGS, 2002a-d). The diversion records from the Rio Blanco show that the majority of runoff occurs in May and June as a result of melting snowpack. The average of monthly streamflow was highest in May and June above the diversion dam at 283 cfs and in June below the diversion dam at 134 cfs. The lowest flows of the year occurred from December through February at both gages and averaged 17 cfs. The diversion records from the Little Navajo show that the majority of runoff occurs in April, May, and June as a result of melting snowpack. Average monthly streamflow was highest in May below the diversion dam at 25 cfs and in May near Chromo at 59 cfs. The lowest flows of the year occurred December through February below the diversion averaging 2.6 cfs. The lowest flows of the year near Chromo occurred in August and September, averaging 1.8 cfs. Floods can occur in any of the watersheds during the summer and fall as a result of extreme precipitation events. Lowest flows of the year occur in the winter and also in the summer as a result of water diversions.

Beneficial Use Classification

The beneficial use water quality classification system is designed to implement the Colorado Water Quality Control Act and to ensure the suitability of Colorado's water for beneficial uses, including terrestrial and aquatic life, recreation, agriculture, and water supply. Streams or stream segments, lakes, and reservoirs can be classified for current or reasonably expected uses, and for uses for which the waters would become more suitable when a water quality goal is attained. All existing and classified uses are to be protected. The classifications are to be for the highest water quality attainable through effluent limitations for point sources and through implementation of cost-effective and reasonable "best management practices" for non-point sources. The table below displays the beneficial uses for streams in the watershed analysis area (Colorado Department of Public Health and Environment [CDPHE], 2002a).

Table 5: Colorado Designated Beneficial Uses for Streams in the Watershed Analysis Area

Stream Segment Description	Beneficial Use Classification
Mainstem of the Little Navajo River, including all wetlands, tributaries, lakes and reservoirs from the headwaters in the South San Juan Wilderness to the San Juan-Chama diversion.	Aquatic Life Cold 1 Recreation 1a Water Supply Agriculture
Mainstem of the Little Navajo River, including all wetlands, tributaries, lakes and reservoirs from the San-Juan Chama diversion to the confluence with the Navajo River.	Aquatic Life Warm 2 Agriculture Recreation 2 – November 1 to April 30 Recreation 1b – May 1 to October 31
Mainstem of Coyote Creek, including all wetlands, tributaries, lakes and reservoirs from the headwaters to the confluence with the Navajo River.	Aquatic Life Warm 2 Agriculture Recreation 2 – November 1 to April 30 Recreation 1b – May 1 to October 31
Mainstem of the Rio Blanco, including all wetlands, tributaries, lakes and reservoirs from the headwaters in the South San Juan Wilderness to the confluence with the San	Aquatic Life Cold 1 Recreation 1a

Stream Segment Description	Beneficial Use Classification
Juan River.	Water Supply Agriculture

These beneficial uses have the following definitions:

Aquatic Life Cold 1: Waters that currently are capable of sustaining a wide variety of cold water biota, including sensitive species or that could sustain such biota but for correctable water quality conditions.

Aquatic Life Warm 2: Waters that are not capable of sustaining a wide variety of cold or warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species.

Agriculture: Waters that are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.

Recreation 1a: Existing Primary Contact. Class 1a waters are those in which primary contact uses have been documented or are presumed to be present. Waters are suitable or intended to become suitable for recreational activities in or on the water when the ingestion of small quantities of water is likely to occur. Uses include, but are not limited to swimming, rafting, kayaking, tubing, windsurfing, and water-skiing.

Recreation 1b: Potential Primary Contact. This classification is assigned to water segments for which no use attainability analysis has been performed demonstrating that a recreation class 2 classification is appropriate, but existing class 1 uses have not been identified.

Recreation 2: These surface waters are not suitable or intended to become suitable for primary contact recreation uses, but are suitable or intended to become suitable for recreational uses on or about the water which are not included in the primary contact subcategory, including by not limited to wading, fishing and other streamside or lakeside recreation.

Water Supply: Waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment these waters will meet Colorado drinking water regulations (CDPHE, 2002b).

All streams, lakes, reservoirs, and wetlands within the South San Juan Wilderness within the analysis area are designated as outstanding waters. Outstanding waters are high quality waters that constitute an outstanding natural resource and are to be maintained and protected at their existing quality.

The Rio Blanco below the San-Juan Chama diversion is currently listed on the state of Colorado 303(d) impaired waters list (Colorado Department of Public Health and Environment, 2002c). This reach of the Rio Blanco exceeds state water quality standards for sediment due to hydrologic modification. All other streams within the analysis area are currently meeting water quality standards for the designated uses and therefore are not on the 303(d) impaired waters list.

Factors Influencing Existing Watershed Conditions

Stream health and general watershed conditions within the analysis area are dependent on several factors such as geology, vegetation, climate, and the effects of land-use history. For this analysis area, apparent watershed status has been estimated based on known conditions in the watershed, their sensitivity and resilience, and the disturbance history in the drainage.

The primary impacts to the streams in the analysis area occur from dewatering due to water diversions, past and present grazing management, and localized impacts from roads. Most streams in the analysis area have been degraded either in the past or present due to land management practices on both the Forest Service and private lands. Many streams on Forest Service lands are healing due to watershed improvement projects and changes in grazing management. The activities that have had impacts on watersheds within the watershed analysis area are described in detail below.

Natural Influences Much of the analysis area is underlain by shale bedrock, which weathers into very fine-grained soil. In these types of soils, vegetation is critical to hold the soil on the hillslopes and stabilize stream channels. Typical high-intensity summer thunderstorms infiltrate very slowly into this type of soil, resulting in rapid runoff. Removal of vegetation or concentration of water enhances runoff and leads to rapid gullying.

Water Diversions Many of the streams within the analysis area are highly modified by the transfer of water between streams. Large structures divert large amounts of water from the Rio Blanco and Little Navajo River and transport this water through a 26-mile-long series of tunnels into New Mexico. Construction began in the 1960s and full diversion of water began in 1971. The tunnel diverts all but 15 cfs in April, 40 cfs in May, and 20 cfs in June through October from the Rio Blanco. The remainder of the year is considered the repair season for the tunnel. There is a State of Colorado minimum stream flow right on the Rio Blanco River of 29 cfs in the summer, though it is typically not enforced as evidenced by the typical summer bypass of 20 cfs from the tunnel (Bishop Brogden Associates, Inc., 2002). These diversions alter the natural hydrograph on these rivers and substantially reduce the amount of water in the rivers below the diversions. This has caused water depths to decrease, water temperatures to increase, stream bank erosion to increase, sediment to increase (due to decrease in transport capabilities of the rivers), and fish population to decline. Property owners along the Rio Blanco west of Highway 84 are in the process of doing river restoration projects along the Rio Blanco. These projects narrow and deepen the river to accommodate the lower flows as a result of the diversion and create pools. In 1999, 1.1 mile of river was restored. Preliminary studies indicate that water temperature decreased through the restored reach. Another mile of river was restored in 2003 and 2004 . Several additional miles of river are planned for restoration in upcoming years. Several small ditches also divert water from the mainstems and tributaries within the analysis area for irrigation.

Grazing The earliest Euro-American use of the Kenney Flats Analysis Area was most likely livestock grazing. Records indicate that the area around Kenney Flats received intensive grazing use during the late 1800s and early 1900s. Anecdotal evidence also suggests that the area was part of a homestead and the land was cultivated and used as winter range by the homesteader's sheep and cattle. Wild horses also ran in the area for a short time until snows decimated the herd during the fall of 1931. During this time

period, stocking levels and season of use were unregulated. Overgrazing during this period caused extensive erosion in meadows throughout the analysis area.

The Forest Service acquired most of the area encompassed by the Kenney Flats area in 1931. At that time, livestock numbers were reduced and season of use was shortened. Erosion control projects were also undertaken at that time by the Civilian Conservation Corps to help restore and improve the watersheds. The area has been part of an active grazing allotment since that time. Various stocking levels and pasture rotations have been used over the years, with stocking and season of use remaining fairly constant. Portions of the vacant Valle Seco Allotment were combined with the Park Allotment in 1995, effectively reducing the stocking on the Park Allotment. Livestock grazing has occurred on the private lands since the 1880s to the present. Some private land has been taken out of grazing management as subdivisions have been developed.

Timber Harvests The Kenney Flats Analysis Area also had a long history of timber harvesting when it was under private ownership in the early 1900s. Railroad grades were established sometime between 1902 to 1908 up Halfway Canyon, Coyote Creek, Boone Creek and several other small drainages. Historic records indicate that most of the area accessed from these railroad grades was heavily harvested in about 1909. The pine-dominated areas accessed from the Valle Seco Road (FSR 653) also appear to have been harvested around the same time. The pine stands accessed from the Buckles Lake Road (FSR 663) do not appear to have been harvested prior to Forest Service ownership.

Several commercial timber sales have also occurred in the area since 1971. Between the year 1971 and 1988, timber harvesting has occurred in Sixhorse Canyon (317 acres in 1971), Buckles Aspen (63 acres between 1973 and 1977), Confar Hill (975 acres in 1978), and Benson Creek (457 acres between 1987 and 1988). In general, the longest lasting impact to watersheds from timber harvest has been the existence of roads which remain open for use.

Transportation Many open and closed roads exist in the analysis area. In general, roads are fairly evenly distributed at a moderate density throughout the watersheds on both Forest Service and private lands. The only exception is in the Little Navajo Watershed, where road densities are low, mostly due to the fact that the upper third of the watershed is within the South San Juan Wilderness area. Table 6 displays road densities by watershed.

Table 6: Existing Road Densities by Watershed

Watershed Name	Total Road Density in Watershed
Lower Rio Blanco	2.7 miles/sq mile
Middle Rio Blanco	2.5 miles/sq mile
Halfway Canyon	2.0 miles/sq mile
Coyote Creek	2.3 miles/sq mile
Little Navajo Creek	1.2 miles/sq mile

Most of the open and closed roads in the watershed analysis area are on relatively flat terrain, "roll" with the terrain, and are not ditched. Improved roads are adequately drained. Unimproved, native surface roads on shale soils are prone to rutting and, therefore, are poorly drained. However, most streams are ephemeral, and water frequently leaves the roads and disperses into flat meadows. This results in little road-derived sediment reaching streams and affecting water quality.

Exceptions to this are where unimproved roads cross small drainages. Road-stream crossings are often sediment sources into streams. The proximity of the road fill to the stream channel means that essentially any sediment eroded off the road fill will be delivered directly to the stream. In the Kenney Flats Analysis Area these crossings are often wet in the spring and after summer thunderstorms. Multiple vehicle tracks have been created in these areas as people attempt to avoid the wet areas. The number of stream crossings by watershed are listed in the following table.

Table 7: Numbers of Stream Crossings by Watershed

Watershed	Stream Crossings
Lower Rio Blanco	47
Middle Rio Blanco	59
Halfway Canyon	12
Coyote Creek	61
Little Navajo River	2

Another disturbance factor to watershed response is related to roads that encroach on stream channels or floodplains. This encroachment constricts and straightens the stream channel and also leads to a loss of riparian and floodplain vegetation. The smaller, straighter channels result in deeper water flows with increased velocities, often resulting in direct erosion, mass failure from undercut fills, opposite bank erosion,

channel scour, loss of shade and channel stability elements; and it can inhibit the stream system's ability to adjust to upstream disturbances and natural events. Miles of road within 100 feet of any stream was estimated from GIS.

Table 8: Miles of Road Within 100 Feet of Streams

Lower Rio Blanco	11.2 miles
Middle Rio Blanco	11.8 miles
Halfway Canyon	5.4 miles
Coyote Creek	18.2 miles
Little Navajo River	4.2 miles

Most of the roads within 100 feet of a stream channel are roads located on private land that run up valleys and Highway 84 through Halfway Canyon and along the Rio Blanco.

In general, improved roads within the analysis area show some rilling with sediment movement off the road surface. This sediment is delivered into grass and other vegetation on the road side. Generally, slopes below the roads are not steep, so sediment does not reach stream channels. Most of the unimproved, native surface roads have inadequate cross drainage. Some sections of these unimproved roads are rutted up to one and one-half feet deep. Stream crossings do not contain culverts or hardened fords, so they become bog holes when wet, resulting in multiple tracks around the wet area. From field reconnaissance, two unimproved open roads and a section of old railroad grade were observed to have direct impacts on streams and have an influence on existing conditions:

Roads 006A and 006C: These are unimproved roads near the end of the Kenney Flats road (FSR 006). These native surfaced roads cross ephemeral drainages without culverts or hardening of the road surface. As a consequence, multiple tracks are present at the crossings and the roads are rutted and do not have adequate cross drainage.

Old Railroad Grade in Coyote Creek and Halfway Canyon: The old railroad grade from the early 1900s that ran from Lumberton, New Mexico to just short of Pagosa Springs ran alongside Coyote Creek and down Halfway Canyon. The railroad tracks and ties have been removed and the alignment is well vegetated with grass. This alignment constricts the channels and floodplains in areas.

Watershed Improvement Projects

Many of the historic land uses practices that have occurred within the analysis area occurred when standards and guidelines did not exist. Parts of Spiler Canyon, Halfway Canyon, and Coyote Creek all contain gully networks to some varying degree or extent. Anecdotal evidence suggests that the gullying evident in these watersheds is the result of erosive soils coupled with grazing practices that occurred at the turn of the century. In addition, much of the large ponderosa pine was harvested from the 1900s to 1920s and exported on the railroad that ran through the area. The reduction in tree cover and

ground cover and the compaction of soils may have increased overland flow of water and initiated a sequence of headcutting and gullying.

The Civilian Conservation Corps constructed erosion control projects in the area during the 1930s. Log and rock check structures, designed to act as sediment traps, were installed in many of the gullies. Over-grazed and eroded areas were fenced to exclude livestock and yellow sweet clover was planted to hold the soil in place. Between 1960 and 1962, 69 of the original CCC structures containing rotted wood were repaired and put on a yearly maintenance schedule that lasted until the 1970s. In 1970, contour trenches, designed to hold surface water on hillsides and deter formation of rills, were dug along the hillsides in three areas, each about 4 to 6 acres in size and can be seen on the east side of Highway 84 between Kenney Flats and Coyote Park. Although many of the symptoms of erosion were treated as early as the 1930s, grazing management on Forest Service lands did not change to reflect the inherent erodibility of the area until the 1960s. At that point, a rest-rotation system with reduced numbers of cattle was initiated. Intensive grazing is still occurring on some private lands within the watersheds.

Current grazing management has caused the area to be in a moderate upward trend with regard to upland conditions and channel stability and recovery. However, some parks have not fully recovered from past overgrazing, which slows channel recovery. Table 9 displays a summary of stream conditions and major factors influencing stream conditions within each watershed in the watershed analysis area. It also identifies any opportunities for improvement of National Forest System lands.

Table 9: Summary of Watershed Conditions and Improvement Opportunities

Watershed	Stream Conditions	Major Factors Influencing Stream Conditions	Improvement Opportunities
Lower Rio Blanco	Fair	Diversion of water, roads, landslides, subdivision development	None on Forest
Middle Rio Blanco	Fair	Diversion of water, roads, landslides	None on Forest
Halfway Canyon	Good to poor	Historic and present gully erosion, roads	Gully stabilization
Coyote Creek	Fair	Historic and present gully erosion, stream bank erosion, grazing, subdivision development	None on Forest
Little Navajo River	Pristine to fair	Roads, subdivision development	None on Forest

Watershed Environmental Consequences

No Action

No forest restoration treatments, gully restoration, or associated road activities are proposed for the analysis area under Alternative 1, however, previously planned prescribed burns will be implemented. There are currently prescribed burns proposed in the Halfway Canyon, Coyote Creek and Middle Rio Blanco watersheds. In general, the proposed prescribed fires would be low severity underburns or broadcast burns, which do not change vegetation overstory or significantly burn soil duff and litter layers. Research has shown that prescribed burns like those associated with Alternative 1 often have minor adverse effects on soil and water, especially when compared to the effects of many wildfires (Baker, 1992). Prescribed burns typically occur during favorable weather conditions and do not usually burn into the crowns of the forest canopy, whereas wildfires have a much higher potential to burn not only the forest canopy, but also the understory and organic layers of forest soils. Light, low-intensity underburns do not appreciably alter vegetation canopy and tend to burn in a mosaic pattern, leaving irregular patches of undisturbed vegetation. These mosaic patches of undisturbed vegetation and lightly burned litter and duff help protect soils from erosion.

Under all alternatives, fireline construction would be minimized by using existing roads or trails, drainages, or natural barriers where possible. Mechanical fireline construction has the potential to create areas vulnerable to erosion in the short term, however prompt rehabilitation following burning should minimize this impact.

Proper implementation of proposed prescribed burning should result in little, if any, change in water yield, runoff characteristics, mass-failure potential, or water quality for Alternative 1. The majority of the terrain where broadcast burning is to be implemented occurs on slopes less than 40%, further limiting risk. There would be no change in the hydrology and existing conditions of the Halfway Canyon, Coyote Creek and Middle Rio Blanco watersheds.

All Action Alternatives

Under all of the action alternatives, constructing check dams or sediment retention basins within the gullies themselves will stabilize existing gullies. These structures establish a rigid base level, which prevents the gully from continuing to downcut. The structures would be constructed wherever physically feasible. Disturbed areas would be reseeded with appropriate grass species when construction is completed. Small headcuts will be stabilized by either sloping back or cleaning up the face of the headcut, laying filter fabric over the bare soil, and placing rock or logs over the filter fabric. This hardens the headcut and reduces that chance that the headcut will continue to erode.

Areas where the gullying has not been well developed could benefit from rehabilitation efforts. The stabilization efforts would need to be monitored for effectiveness

Alternative 2

Under Alternative 2 thinning would occur in 25 percent increments every 5 years over a 20-year period. A total of 3,388 acres would be entered four times in 5-year intervals. Trees would be felled and left on-site. No access roads, spur roads, skid trails or landings would be constructed under this alternative because the material is left on-site.

Firewood gathering and prescribed burning would be conducted to reduce fuel loading levels. The table below compares the acreage restored in each watershed and the percent of total watershed affected, under Alternative 2.

Table 10: Acres of Forest Restoration - Percent of Affected Watershed Under Alternative 2

Watershed	Acres Affected	Percent Watershed Affected
Lower Rio Blanco	533	5%
Middle Rio Blanco	0	0%
Halfway Canyon	1,239	31%
Coyote Creek	1,609	6%
Little Navajo River	7	0%
Total	3,388	-

Only the Halfway Canyon, Coyote Creek and Lower Rio Blanco watersheds are affected by mechanical treatments. The seven acres that affect the Little Navajo River watershed affect only a fraction of a percent of the total watershed area. Halfway Canyon has the greatest percentage of watershed area to be affected.

While felling of trees will decrease evapotranspiration from the area, there would be an increase in water infiltrating the soil due to the accumulation of woody debris left on the ground that would disrupt overland flow. The direct or indirect risks of water yield creating in-channel changes would be very low.

Under Alternative 2, there will be no reconstruction or new construction of roads, skid trails or landings, which means that increased sediment over existing conditions would originate only from the tree felling and subsequent burning.

Sediment yield from broadcast burning will increase with burn severity. Where fuels are limited and burn severity can be kept low resulting impacts from sedimentation will be limited. However, where fuels are heavy, burn severity could be high resulting in a higher likelihood of complete consumption of ground cover and the development of hydrophobic soils, which would mean a reduced capacity for infiltration and an increase in runoff and erosion. Impacts from broadcast burning may be significantly greater than those described in Alternative 1 since the burn severity may be increased due to the increased fuel load on the ground surface resulting from harvested timber that is not removed. Effects from sedimentation to water quality under Alternative 2 could be major if burning to reduce fuels results in high burn severity.

The proposed mowing would produce chopped woody material that would disrupt overland flow and aid in increasing infiltration.

Alternative 3

The total treatment area proposed under Alternative 3 is the same as under Alternative 2 (3,826), however, this acreage is divided into four treatment areas that are identified in *Figure 5, Kenney Flats Alternative 3: Successive Complete Treatments, Single Entries*. The four areas will be treated in consecutive five –year intervals. Table 18 shows the area disturbed within each watershed in acres and percent of the watershed.

Fuels reduction will be accomplished through commercial logging contracts, service contracts, and broadcast burning following logging. All logging will be completed using ground-based methods such as small tractors or rubber-tired skidders. Trees would be felled and left on site within Treatment Areas 15, 16, and 17 totaling 208 acres located in the Halfway Canyon watershed. Mowing and burning of the 440 acres of buffer areas described in Alternative 2 would also be completed in the first five-year period under this alternative.

There will be approximately 8.9 miles of road reconditioning, 2.4 miles of road reconstruction, and 3.5 miles of temporary road construction across the analysis area. Skid trails and landings will also be used as needed. Road work will increase sediment yield in the short term (up to 10 years). Existing FSR Roads 006A and 006C are located in areas with erosive soils that experience active gullying. Roads crossing low points in the drainages and boggy areas will be rocked and graveled which will reduce the potential for erosion and sedimentation. Proper location of roads and use of Watershed Conservation Practices Handbook practices should minimize sediment yield and erosion.

Table 11: Acres of Treatment Areas and Percent of Affected Watershed Under Alternative 3

	Years 1-5		Years 6-10		Years 11-15		Years 16-20		Total Acreage
Lower Rio Blanco	81 acres	1%	452 acres	4%	0 acres	0%	0 acres	0%	533 acres
Halfway Canyon	509 acres	13%	278 acres	7%	0 acres	0%	452 acres	11%	1,239 acres
Coyote Creek	862 acres	3%	0 acres	0%	453 acres	2%	294 acres	1%	1,638 acres
Little Navajo River	0 acres	0%	0 acres	0%	7acres	0%	0 acres	0%	7 acres
Middle Rio Blanco	0 acres	0%	0 acres	0%	0 acres	0%	0 acres	0%	0 acres
Total	1,452 acres		730 acres		460 acres		746 acres		3,388 acres

Surface disturbance from ground-based logging results in a comparative high degree of surface disturbance to the areas subjected to equipment traffic and log skidding. Overall, approximately 3 to 5 percent of each unit subject to this logging method will be affected by skid trails with the upslope skid trail length reaching 1,000 feet. Average

yarding distance is estimated at approximately 300 to 400 feet. These disturbances break up the duff and litter layers resulting in increased soil erosion and sedimentation. Some thinning will impact areas where slopes are up to 35 percent; however, the majority of the activity will be limited to areas where slope ranges from 4 to 25 percent.

Watershed Conservation Practices Handbook practices will be implemented during and after logging and burning. These measures would include water bar construction, and, ripping and seeding areas subjected to compaction from equipment during logging. Stream buffers would be designated that would mitigate direct impacts and retain filtration properties of near-channel vegetation.

Mowing of 440 acres of vegetation will also be done under Alternative 3 prior to broadcast burning. Broadcast burning following logging under Alternative 3 would have the same effects as burning under Alternative 1. The burn would be designed and managed to be a low burn severity having minimal effect on watershed function. Since trees will be removed from the site (with the exception of Units 15, 16 and 17 where trees will not be removed), the potential for the burn to turn into a high severity burn would be minimized because the available fuel would be substantially reduced compared to Alternative 2.

Alternative 4

Under Alternative 4 all proposed logging and fuel treatments on 3,826 acres within the analysis area would be completed during one initial entry. All treatment units would be affected simultaneously. This acreage includes the mowing of 440 acres of vegetation. Broadcast burning would follow logging within the treatment areas. Merchantable trees would be removed in all units except Units 15, 16 and 17, using ground-based or tractor logging as described in Alternative 3. Road activities would be the same as those described under Alternative 3. Stream buffers would be designated that would mitigate direct impacts and retain filtration properties of near-channel vegetation.

The surface area disturbance is the same under Alternative 3 and 4, however the temporal scale is different. Under Alternative 4, all mechanical treatments occur within years 1 through 5, and prescribed burning years 6-10 whereas under Alternative 3, impacts are spread over 20 years. While short-term impacts from erosion and sedimentation from treating the entire 3,826 acres in 5 – 10 yearswould increase under Alternative 4, the long-term recovery would not be interrupted from multiple entries, as it would be under Alternatives 2 and 3.

Range

The Kenney Flats Analysis Area has been grazed since the early 1900s. Portions of 3 range allotments occupy the majority of the analysis area, including Park/Valle Seco (11,253 total, 8,967 acres within the analysis area), Coyote Creek (6,071 acres total, 4,290 acres within the analysis area), and Klutter (3,423 total, 2,040 acres within the analysis area). Consistent with grazing impacts elsewhere on the Pagosa District, grazing was likely heavy in the scattered meadows and along stream courses in the analysis area. Before the 1970s, higher numbers were run on all three allotments. Historic grazing practices may have led to the reduction of fine fuels (in this case, grasses) that reduced the spread of fires, especially on lower-elevation sites in the analysis area. More recently, with the advent of fire suppression, cattle grazing has had

little effect on forest structure within the analysis area, since stocking rates are relatively low and areas are frequently rested or deferred.

These 3 allotments have exhibited decreased forage production during the past 6 years of drought. About 1,461 acres of open meadows in the three allotments are considered primary range. Very little of the analysis area displays an overall utilization of greater than 50%, which would exceed Forest Plan standards.

The Park/Valle Seco allotment occupies 11,253 total acres, 8,967 of which are located within the Kenney Flats Analysis Area. The current stocking rate on the Park/Valle Seco allotment is 186 cow/calf pairs from June 1st to October 5th for a total of 787 Animal Unit Months (AUM's). This allotment is operated with a 7 pasture rest rotation grazing system and the most recent Allotment Management Plan was written in 1998. The most recent range analysis was completed in 1995. According to this analysis, trend was stable over a majority of the allotment and the primary grassland areas are in an early to mid-seral ecological stage.

The Klutter Allotment is 3,423 total acres, 2,040 of which are located within the analysis area. During the 2002 grazing season the Valle Seco and Klutter Allotments were run together under a four pasture deferred rotation grazing system. There was very little water on these allotments and livestock were not left on the allotment very long. The same permittee that has permits on the Park/Valle Seco Allotments acquired the Klutter Allotment prior to the 2002 season.

The proposed stocking rate for last year's combined Klutter and Valle Seco Allotments was 60 head of yearlings from 6/1–9/30, or 240 AUM's total. Prior to 2002 the Klutter Allotment was run under a three pasture deferred rotation grazing system with a stocking rate of 50 head of yearlings from 6/1-9/30. The Allotment Management Plan dates to March 6, 1970. The original plan called for a rest rotation grazing system. In 1985 it was amended to incorporate the deferred rotation system.

Most of the range analysis in this allotment dates to the late 60s (1968) with some updates made in the early 80s (1984). The apparent trend is moving toward the desired plant community.

The Coyote Creek Allotment is 6,071 acres total, 4,290 of which are located within the analysis area The FONSI for the Coyote Creek Allotment Management Plan EA was signed on April 8, 1993. An Allotment Management Plan was signed on February 16, 1994. The allotment is managed under a modified 4 pasture deferred rest/rotation system. Specific rotation dates are developed each year with the annual operating instructions. The allotment is permitted for 248 yearlings with a season of use from May 21-September 30.

Range analysis was completed on the allotment during the summer of 1992. Ecological condition of the secondary range was determined to be mid-seral or higher. Ecological condition of the primary range varied from early mid seral to mid seral, with some isolated areas in the southern end of the allotment being in an early seral stage. The overall trend of the allotment was determined to be stable to upward. Areas at the southern end of the allotment that were historically hit the hardest show a definite upward trend.

Range Environmental Consequences

No Action

Under the No Action Alternative, other than in previously authorized prescribed fire units, forage production in ponderosa pine stands would continue to be less than is thought to have occurred historically prior to the domination of the understory by Gambel oak. Over the long term (100+ years), there would likely be less productivity in secondary range throughout the analysis area as Gambel oak and densely stocked ponderosa pine continue to develop and shade the understory. The carrying capacity of the allotments would likely be reduced under this situation over the long term.

Alternative 2

Since thinned material will be left of the ground, livestock mobility will be negatively impacted, which will decrease the utilization of secondary range. Primary range would likely receive increased grazing pressure since access to secondary range will be limited. Burning the thinned material will help reduce this impact. In addition to limiting mobility, leaving thinned material on the ground will reduce forage production until burning is accomplished. If burning is of high severity, there could be a resulting loss of ground cover and propensity for the development of hydrophobic soils which would cause reduced productivity.

Alternatives 3 and 4

Under Alternatives 3 and 4, a reduction of fuel loading following the harvest treatments and prescribed burning would increase forage production and improve livestock mobility and distribution in the analysis area over the long term. There may be short term displacement of livestock under Alternative 4 with all the activity occurring over a 5 year time frame. More secondary range would be maintained over the long term (100+ years) under these alternatives than under Alternatives 1 or 2.

Fisheries

Affected Environment

There are no streams within the analysis area that support fish. The Blanco River, north of the analysis area, does support fish. Fish known or suspected to inhabit the Blanco River include brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), rainbow trout-cutthroat trout hybrids, rainbow trout (*Oncorhynchus mykiss*), mottled sculpin (*Cottus bairdi*), flannelmouth sucker (*Catostomus latipinnis*), white sucker (*Catostomus commersoni*), bluehead sucker (*Catostomus discobolus*), fathead minnow (*Pimephales promelas*), roundtail chub (*Gila robusta*), and speckled dace (*Rhinichthys osculus*).

The Colorado pikeminnow and razorback sucker are endangered fish known to inhabit the lower reaches of the San Juan River in New Mexico, and portions of the Colorado River in Colorado and Utah. Activities that deplete water from the San Juan and Colorado River Basins have been identified by the U.S. Fish and Wildlife Service (USFWS) as having adverse cumulative effects to both species. Providing adequate flows for these fish is a primary component of their recovery.

The Colorado River cutthroat trout (CRCT) is listed by Region 2 of the Forest Service as a sensitive species. Historically, CRCT are sure to have occupied the Blanco River. Over time, pure-strain CRCT became less common and eventually lost the competitive battle

to exotic species introduced to the San Juan Basin. Today, hybrid individuals (rainbow/cutthroat mixed) occupy the Blanco River.

The San Juan National Forest Land and Resource Management Plan (LRMP) or Forest Plan, identifies brown trout, brook trout, rainbow trout, and Colorado River cutthroat trout as Management Indicator Species (MIS). Because there are no fish bearing streams in the analysis area, and project activities will not affect fish or aquatic habitat in the Blanco River, none of these species are selected as MIS for this project.

Environmental Consequences

Under the No Action Alternative, fish and aquatic habitat in the Blanco River will remain unchanged. Any potential impacts to fish populations and habitat are limited to natural and human influences.

For Alternatives 2, 3, and 4, there will be no direct, indirect, or cumulative effects to fish as there are no fish bearing streams in the analysis area, and the proposed action will not affect fish populations or habitat in the Blanco River.

The USFWS has determined that water depletions and regulated flows are current activities with the greatest impact on the endangered Colorado River fishes. The proposed action will not result in any water depletions within the San Juan River Basin. A determination of No Effect was reached in the Biological Assessment (*Appendix C*) for theColorado pikeminnow and razorback sucker.

MANAGEMENT INDICATOR SPECIES

Affected Environment

One of the goals of managing National Forest System (NFS) lands is to provide for healthy ecosystems capable of sustaining viable populations of wildlife species. These ecosystems include many different habitat types that support a variety of wildlife species. Due to the large number of species potentially occupying any given area, it would be impossible to evaluate the status of all species in an area over time. Therefore, a subset of species is selected to represent larger groups of species which have similar habitat needs or similar population characteristics, and whose populations can be quantitatively ascertained. These are referred to as Management Indicator Species (MIS). Species identified as MIS are selected because their population changes are believed to indicate the effects of management activities on wildlife populations as a whole (36 CFR 219.19 [a] (1).

Each National Forest is managed under a Land and Resource Management Plan (LRMP) or Forest Plan. The Forest Plan establishes management goals and objectives, including those for resident wildlife species. The Forest Plan identifies MIS for the purpose of evaluating Plan alternatives, and to assist in the ongoing evaluation of Plan implementation. The Plan contains management objectives, standards and guidelines, and monitoring requirements specific to MIS. For the San Juan National Forest Plan, management objectives and standards and guidelines are found Chapter III, Management Direction, pages IIIa-1 to III-291. Monitoring guidelines specific to MIS are found in Chapter IV, Monitoring and Evaluation, pages IV-3 to IV-4. These requirements are applicable to all actions conducted on NFS lands, and are based on the laws, regulations and policies governing National Forest Management.

The primary objective of any MIS assessment is to identify Forest-wide trends in population numbers, Forest-wide trends in habitats that support these populations, and to identify any possible relationship between observed changes in habitat and changes in wildlife populations, as described in 36 CFR 219.19 [a] (6). Analysis of population and habitat status that presently exists at the project level can then be related to the large-scale trend analysis. This can result in better identification of cause and effect relationships, which in turn support alternative selection. The analysis may also help identify information needs and help focus Forest-level monitoring efforts.

There may be situations where it is appropriate to use habitat trend alone as a surrogate for population trend. This occurs when it is well established in the scientific literature that the tie between habitat and species abundance is unusually strong and that population trends follow habitat trends. This approach is often applied when population data are unattainable or unreliable and habitat data alone provide a better understanding of population trends.

Scope of MIS Analysis

Forest Service regulations and policies establish the need to evaluate trends of MIS populations and identify any relationship to changes in their habitats at the Forest-wide scale (36 CFR 219.19 [a] (6). Because of the large scale being considered, the data used to identify these trends is often general and coarse in nature. In many cases, the results provide an initial “heads-up” look at how populations and habitats might be changing. This scale of analysis is not intended to identify the specific limiting factors that determine population structure. While it may be possible to acquire some relevant information about these factors, such attempts are often technically infeasible and not cost effective. Limiting factor assessments are best left to small-scale applications and may or may not incorporate population trend analyses. Where technically feasible, this MIS analysis addresses trends in species abundance and their associated habitats at the Forest-wide scale. It then relates what is known at the project level about species occurrence and habitat distribution in a manner that addresses project effects to overall Forest-wide trends.

The MIS species selected for this proposed action are well distributed across the San Juan National Forest (SJNF). Areas adjacent to the analysis area provide terrestrial habitats that are well distributed and connected to the larger national Forest unit. The analysis area does not provide unique or isolated habitats within which discrete populations are dependent. The MIS are not species at risk nor are they species that are trending towards protected status. Our concern is how this project may affect the broader Forest-wide trends for these MIS species.

Fisheries MIS Analysis

As mentioned in the fisheries section, there are no streams, rivers, lakes, or other bodies of water containing fish in the analysis area. Additionally, the proposed action will have no effect to fish or aquatic habitat in the Blanco River. Given the absence of fish in the analysis area, and no effects to aquatic habitat in the Blanco River, there will be no effect on MIS fish from this project. Given this situation, no fish MIS are selected for analysis.

Wildlife MIS Analysis

Species Selection and Non-Selection

Five species were selected for the MIS analysis; Abert's squirrel, Rocky Mountain elk (hereafter referred to as elk), green-tailed towhee, hairy woodpecker, and mountain bluebird. Abert's squirrels are year-round residents in ponderosa pine forests. Elk are generalists that use a variety of habitat types across the SJNF. Elk are present in the analysis area year-round, but show the greatest abundance during spring, fall, and early winter. Green-tailed towhees are migratory birds that occupy the area during spring and summer. Hairy woodpeckers are year-round primary cavity nesters in aspen and other forest types. Mountain bluebirds are secondary cavity nesters that occupy the area from spring through fall. Habitat and species information, including status, distribution, and trend utilized in this analysis are contained in Forest-wide MIS Assessment documents on file at the Pagosa Ranger District Office.

The MIS selected represent larger groups of species. Abert's squirrels are associated with mature and older ponderosa pine forests with habitat requirements similar to other species including northern goshawk, flammulated owl, pygmy nuthatch, and others. Green-tailed towhees thrive in mountain shrublands (includes Gambel oak) which they use for nesting and foraging similar to other shrub nesting birds including Virginia's warbler, spotted towhee, and others. Hairy woodpeckers are primary cavity nesters with habitat requirements similar to other species including downy woodpecker, flickers, and others. Elk and other wildlife species including black bear and Merriam's turkey use a variety of habitat structural stages (HSS) across numerous vegetation types for food and cover. Mountain bluebirds are secondary cavity nesters that nest in snags or live trees along edge habitats similar to pygmy nuthatches and other bird species.

Several SJNF MIS have been dismissed from this analysis (Table 12). These species were eliminated because they are typically found in habitats that do not occur in the analysis area, are not known to exist in the analysis area, have not developed a functional population structure on the SJNF to determine population trend from management actions, or have been substituted with other MIS because of similar habitat requirements. Rationale for dismissing each of these species is provided in the following table.

Table 12: MIS selected for analysis, and dismissed from further evaluation

MIS are from the 1983 and Amended 1992 Forest Plan, and federally listed species are from the February 26, 2004 list confirmed on June 1, 2004 with the USFWS.					
MIS	Habitat Used	Reason for Selection in Forest Plan	Habitat Present in the Analysis Area? (Y/N)	Selected for MIS Analysis (Y/N)	Rationale for Dismissal
Abert's squirrel	Ponderosa pine	Unique habitat, species easily monitors change, limited range	Y	Y	

MIS are from the 1983 and Amended 1992 Forest Plan, and federally listed species are from the February 26, 2004 list confirmed on June 1, 2004 with the USFWS.					
MIS	Habitat Used	Reason for Selection in Forest Plan	Habitat Present in the Analysis Area? (Y/N)	Selected for MIS Analysis (Y/N)	Rationale for Dismissal
		Nationwide			
American marten	Spruce-fir and cool-moist mixed conifer	Unique habitat, species easily monitors change	N	N	Very limited habitat present for American martens in the analysis area. The proposed action will not occur in marten habitat. The proposed action will have no impact on American martens or marten habitat in the analysis area.
Beaver	Aquatic, riparian, and aspen	Unique habitat	N	N	Beaver are not useful as a MIS. There are no acceptable protocols for monitoring beavers. Monitoring would unlikely provide meaningful information on mgmt. actions until populations have stabilized and reached carrying capacity. There is no habitat or beaver population in the analysis area.
Black bear	All forested types, grassland, riparian, mountain shrub/Gambel oak, aspen, and piñon-juniper	Economically important, represents large group of species	Y	N	Black bears are not useful as MIS. Bears are difficult to enumerate, and difficult to monitor at a Forest scale. It would be difficult to obtain density information even with unlimited funds. Bears are habitat generalists similar to elk. Elk and green-tailed towhee share similar habitat requirements and are used as the representative MIS.
Canada lynx	Mixed conifer, spruce-fir and aspen	Threatened Species	Y	N	Canada lynx are not useful as a MIS. Native lynx have not been confirmed to exist on the SJNF since the early 1990s. Lynx recently released by the Colorado Division of Wildlife (CDOW) on the SJNF do not appear to have established functional population structures. For these reasons it is not possible to monitor the effect of mgmt. actions on lynx population

MIS are from the 1983 and Amended 1992 Forest Plan, and federally listed species are from the February 26, 2004 list confirmed on June 1, 2004 with the USFWS.

MIS	Habitat Used	Reason for Selection in Forest Plan	Habitat Present in the Analysis Area? (Y/N)	Selected for MIS Analysis (Y/N)	Rationale for Dismissal
					trend. The proposed action will have no effect on lynx or lynx habitat in the analysis area.
Deer mouse	All terrestrial habitats except alpine	Unique habitat and represents larger group of species	Y	N	Deer mice are not useful as a MIS. Population trends are influenced by climatic conditions and local food availability, and less related to changes in habitat conditions. Because of this, it is not reasonable to draw meaningful conclusions from mgmt. actions.
Elk	All terrestrial habitats; pine, piñon-juniper and mountain shrub/Gambel oak in winter	Economically important, public issue	Y	Y	
Mule deer	All terrestrial habitats; pine, piñon-juniper and mountain shrublands/Gambel oak in winter	Economically important, public issue	Y	N	No, elk are used as the representative MIS given similar habitat requirements.
River otter	Aquatic and riparian	State Endangered Species	N	N	River otters are not useful as MIS. There are no acceptable protocols for reliably monitoring otters. Until otter populations have stabilized and reached carrying capacity, the species is unlikely to provide meaningful information on mgmt. actions. There is no habitat for otters in the analysis area.
Bonytail	Aquatic	Endangered Species	N	N	There is no habitat in the analysis area for the endangered fishes. The proposed action will not deplete water from the San Juan or Upper Colorado River Basins.
Humpback chub	Aquatic	Endangered Species	N	N	
Colorado pikeminnow	Aquatic	Endangered Species	N	N	
Razorback sucker	Aquatic	Endangered Species	N	N	
Brook trout	Aquatic	Economically important	N	N	There is no habitat or populations of brook trout in

MIS are from the 1983 and Amended 1992 Forest Plan, and federally listed species are from the February 26, 2004 list confirmed on June 1, 2004 with the USFWS.

MIS	Habitat Used	Reason for Selection in Forest Plan	Habitat Present in the Analysis Area? (Y/N)	Selected for MIS Analysis (Y/N)	Rationale for Dismissal
					the analysis area. The proposed action will have no impact on brook trout.
Brown trout	Aquatic	Economically important	N	N	There is no habitat or populations of brown trout in the analysis area. The proposed action will have no impact on brown trout.
Rainbow trout	Aquatic	Economically important	N	N	There is no habitat or populations of rainbow trout in the analysis area. The proposed action will have no impact on rainbow trout.
Colorado River cutthroat trout	Aquatic	Most restrictive habitat requirements of the salmonids, would monitor change	Y	N	There is no habitat or populations of Colorado River cutthroat in the analysis area. The proposed action will have no impact on the Colorado River cutthroat trout.
Bald eagle	Mature forests associated with large bodies of water	Threatened Species	Y	N	Bald eagles are not useful as MIS. Because of the normally irregular nature of bald eagle nest site occupancy, it is difficult to draw reliable conclusions regarding a cause and effect relationship between management actions and nest site occupancy. There are no known nests present in the analysis area. Consequently, the Forest Service cannot monitor any current populations. Bald eagles are addressed in the Biological Assessment.
Mexican spotted owl	Mature ponderosa pine and mixed-conifer in canyons	Threatened Species	N	N	Mexican spotted owls are not useful as MIS. Spotted owls have not been confirmed to breed on the SJNF, therefore it is not possible to monitor population trend or draw meaningful conclusions about mgmt. actions. There is no habitat or spotted owl

MIS are from the 1983 and Amended 1992 Forest Plan, and federally listed species are from the February 26, 2004 list confirmed on June 1, 2004 with the USFWS.

MIS	Habitat Used	Reason for Selection in Forest Plan	Habitat Present in the Analysis Area? (Y/N)	Selected for MIS Analysis (Y/N)	Rationale for Dismissal
					population in the analysis area. The proposed action will have no effect on the Mexican spotted owl.
Northern goshawk	Generalists that uses mature forest habitats for nesting	Unique habitat and environmentally sensitive	Y	N	Northern goshawks are not useful as MIS. Because of the normally irregular nature of goshawk territory occupancy on the SJNF, it is difficult to draw reliable conclusions regarding a cause and effect relationship between management actions and goshawk territory occupancy. Goshawks are addressed in the Biological Evaluation.
Columbian sharp-tailed grouse	Mountain shrublands	Limited habitat on the SJNF	Y	N	Columbian sharp-tailed grouse are not useful as MIS. The species has not occurred on the SJNF for decades.
Green-tailed towhee	Mountain shrub/Gambel oak, pinyon-juniper, pine/oak sagebrush, and riparian	Unique habitat, habitat that can be monitored	Y	Y	
Hairy woodpecker	All forested types, aspen, and pinyon-juniper	Unique habitat, habitat that can be monitored	Y	Y	
Mallard	Aquatic and riparian	Economically important and wetland habitat indicator	N	N	Mallard habitat is limited to stock ponds in the analysis area. The proposed action will avoid stock ponds and riparian areas. There will be no impact on mallards or their limited habitat.
Merriam's turkey	Grasslands, riparian, mountain shrub/Gambel oak, aspen, pinyon-juniper, ponderosa pine, and mixed conifer	Limited habitat on the SJNF that would readily monitor change	Y	N	Merriam's turkeys are not useful as MIS. There are no techniques available to reliably estimate density or population size of Merriam's turkeys. Turkeys depend on a mix of habitats, and detecting changes in populations due to mgmt. actions probably is impossible unless their

MIS are from the 1983 and Amended 1992 Forest Plan, and federally listed species are from the February 26, 2004 list confirmed on June 1, 2004 with the USFWS.					
MIS	Habitat Used	Reason for Selection in Forest Plan	Habitat Present in the Analysis Area? (Y/N)	Selected for MIS Analysis (Y/N)	Rationale for Dismissal
					important food sources or nesting habitat are severely reduced across the Forest. Elk and green-tailed towhee share similar requirements as turkeys. These species are used as the representative MIS.
Mountain bluebird	Cavity nester in alpine, aspen, mixed conifer, mountain shrub/Gambel oak, pinyon-juniper, ponderosa pine, and sagebrush	Unique habitat that would monitor management practices	Y	Y	
Southwestern willow flycatcher	Willow riparian	Endangered Species	N	N	Southwestern willow flycatchers are not useful as MIS. Extremely limited distribution on the SJNF and monitoring limited populations is unlikely to provide meaningful information on Forest-wide mgmt. actions. There is no suitable habitat or flycatchers in the analysis area.
Uncompahgre fritillary butterfly	Snow willow in alpine	Endangered Species	N	N	Uncompahgre fritillary butterflies are not useful as MIS. There are no populations on the SJNF. There is no habitat present in the analysis area.

Habitat for each MIS selected was modeled using HSS and cover type information described in MIS Assessments for the SJNF. Habitat structural stages were determined using Common Vegetation Unit (CVU) data retrieved from the Forest's GIS. Habitat modeling was determined by evaluating HSS matrices described by Towry (1984), distribution information across the SJNF, professional judgment of wildlife biologists on the SJNF, coordination with CDOW, and field reconnaissance of the analysis area. Existing habitat for each MIS is displayed in Table 13

Table 13: Existing habitat for MIS.

Species	Habitat	Existing Habitat on NFS Lands (acres and % of analysis area)
Abert's Squirrel	Ponderosa pine HSS 4A, 4B, and 4C	7,228 (52%) suitable, and 3,823 (27%) optimal
Elk cover	Aspen, cool-moist mixed conifer, warm-dry mixed conifer, pinyon-juniper, and ponderosa pine HSS 3B, 3C, 4B, and 4C	4,976 (36%)
Elk foraging	Grass-forbs, mountain shrub/Gambel oak, riparian, sagebrush, aspen (3A) warm-dry mixed conifer (4A) and ponderosa pine (4A).	9,017 (64%)
Elk winter range as determined by CDOW	Grass-forb, mountain shrub/Gambel oak, riparian, sagebrush, aspen (3C), cool-moist mixed conifer (3B and 4B), warm-dry mixed conifer (3B, 4A, 4B, and 4C), pinyon-juniper (4B), and ponderosa pine (3B, 4A, 4B, and 4C)	12,282 (88%)
Elk winter range identified as 5B in Forest Plan	Grass-forb, mountain shrub/Gambel oak, riparian, cool-moist mixed conifer (3B and 4B), warm-dry mixed conifer (3B, 4A, 4B, and 4C), and ponderosa pine (3B, 4A, and 4B).	1,602 (11%)
Green-tailed towhee	Grass-forb, shrub/Gambel oak, sagebrush, warm-dry mixed conifer (3B and 4A), and ponderosa pine (3B and 4A)	7,567 (54%)
Hairy woodpecker	Aspen (4B), cool-moist (4B), warm-dry mixed conifer (4A, 4B, and 4C), pinyon-juniper (4B), and ponderosa pine (4A, 4B, and 4C)	8,182 (58%)
Mountain bluebird foraging	Grass-forb and riparian	1,505 (11%)
Mountain bluebird nesting	Aspen (4B*), cool-moist mixed conifer (4B*) warm-dry mixed conifer (4A, 4B*, and 4C*), pinyon-juniper (4B*), and ponderosa pine (4A, 4B*, and 4C*). * = only those stands within 50 meters of bluebird foraging habitat.	3,727 (27%)

Wildlife MIS Affected Environment

Abert's Squirrel

Abert's squirrels are limited in their distribution to ponderosa pine forests and appear ecologically dependent on ponderosa pine for food, cover, and nest sites (Keith 1965). Abert's squirrels have been observed in and adjacent to the analysis area, and are considered year-round residents. Ponderosa pine and Abert's squirrels are so interdependent that their population trend may be inferred by using species-habitat relationships.

Habitat preferred by these squirrels is uneven aged ponderosa pine stands, with even aged groups within the stands, open understories, and high canopy base levels (Patton 1975). Seeds in ponderosa pine cones are a major food item for the Abert's squirrel from May until November (Keith 1965). The best cone producers are trees over 20 inches in DBH (Larson and Schubert 1970) but when present in high densities smaller trees may provide numerous cones. Cone production fluctuates from year to year with good cone crops occurring at 3 to 5 year intervals or more. Mushrooms are also consumed in copious amounts by the squirrels (Stephenson 1975). The most important are the truffle-like genera (Gantieria) that grow in close association with the roots of conifers, especially within ponderosa pine communities that accumulate a large amount of tree

litter. As this material decomposes it apparently creates a favorable condition for certain fungi (Patton 1975).

Abert's squirrel nest trees are typically located in a group of trees (3 or more according to Keith (1965) with interlocking crowns (Keith 1965). Tree dominance strongly influences a squirrel's choice within a group. Patton (1975) reported that 75% of the trees selected for nesting were co-dominants or intermediates, indicating preference for a crowded tree within a group for cover. A nest tree located in a group of trees, with crowns interlocking or only a few feet apart, offers protection and alternate escape routes from predators as opposed to a nest tree in a less dense stand.

It is apparent from the work of several researchers that Abert's squirrels prefer nest trees that are 9" or greater in diameter at breast height (Patton 1975, Hall 1981, Keith 1965, Pederson 1987, SJNF unpubl. data, and Halloran and Bekoff 1994) with basal areas greater than 60 square feet per acre (Patton 1975, SJNF unpubl. data). The most common predators of Abert's squirrels are goshawks, red-tailed hawks and coyotes.

Abert's squirrel habitat is well distributed across the analysis area. Approximately 52% (7,228 acres) of the analysis area provides suitable habitat for Abert's squirrel. Approximately 27% (3,823 acres) of the analysis are provides optimal habitat for forage and cover.

The Forest Plan describes nest tree clump retention in ponderosa pine forests which includes; protecting or providing for one Abert's squirrel nest tree clump (0.1 acre of 9–22-inch DBH ponderosa pine in basal areas of 180 to 220 with interlocking canopy) per 6 acres on all ponderosa pine sites. Based on habitat analysis and field reconnaissance of the analysis area, Forest Plan direction is currently being met, however the even aged structure of most ponderosa pine stands, in combination with the lack of clumpiness within those stands, reduces the habitat quality that the site could potentially provide. Recent surveys to assess habitat quality and squirrel distribution show relatively low squirrel densities, ranging from <0.01 to 0.11 squirrels/hectare or <0.02 to 0.27 squirrels per acre. This data reflects very low squirrel densities as seen also in Utah and Arizona (N. Dodd, pers.com). Dodd observed that squirrel densities have been declining since 2002 for Arizona, southern Utah and New Mexico and attributes this to severe regional drought conditions occurring for the same time period (Dodd, pers. com.)

There have been many activities across the SJNF that have influenced habitat for Abert's squirrels. Activities such as fire suppression, timber harvest, and others have resulted in stand structures and species compositions that differ to varying degrees from pre-settlement conditions. Past and current influences have resulted in 95.6% (230,878 acres) of the ponderosa pine type across the Forest providing suitable habitat for Abert's squirrels. Approximately 50% (121,717 acres) of the total ponderosa pine type provides optimal Abert's squirrel habitat on the Forest. Based on habitat analysis, the 20-year trend for suitable Abert's squirrel habitat is stable (0.4% decrease) with a slightly downward trend in optimal habitat (2.8%).

Based on habitat analysis, Forest-wide population trend surveys, information from other agencies and professionals, and the documented close tie of populations to habitat condition recorded in the literature, population trend for the Forest does not differ from habitat trend, being generally stable with a possible slight downward trend. Monitoring of population trends, using protocol established by Dodd et al (1998), has occurred since

2003 on the Forest. Nine 60-acre plots were established in 2003, providing over 2,300 data points for the Forest. Eighteen additional plots were established in 2004, providing close to 7,000 data points. Recorded densities in 2003 for the Forest range from 0 squirrels per acre to 0.39 squirrels per acre, averaging 0.11 squirrels per acre. In 2004 densities ranged from 0 squirrels per acre to 0.27 squirrels per acre, averaging less than 0.02 squirrels per acre.

This decrease in density from 2003 to 2004 correlates with similar monitoring efforts utilizing the same methodology in Arizona, southern Utah and New Mexico. Recorded densities for southern Utah are very similar to those recorded for the Forest. Dodd observed that squirrel densities have been declining since 2002 for these states and attributes this to severe regional drought conditions occurring for the same time period (Dodd, pers. com.). The normal boom-or-bust fluctuations in squirrel numbers could confound interpretation of MIS monitoring, unless it includes consideration of all factors that make populations go up and down, such as drought, etc. (Keith, 2003). Locally, and across Colorado, the CDOW considers the status of Abert's squirrel as secure and persistent enough to support a hunting season.

Elk

Elk use most of the landscape within and surrounding the analysis area for foraging and cover. Elk sign, in the form of tracks, pellet piles, vegetation nibbles from browsing, game trails, and bedding areas is evident throughout the analysis area.

As described by Towry (1984) elk have three broad habitat requirements: 1) feeding, 2) cover, and 3) rearing. All three of these habitat requirements exist across the analysis area. Feeding and cover requirements are important year-round on summer and winter range. Rearing requirements are important during a very brief period in the spring on summer range.

Elk habitat is well distributed across the analysis area. Forage to cover ratio of 60:40 is considered optimal for elk (Towry 1984). Approximately 64% (9,017 acres) of the area provides forage, while 36% (4,976 acres) provides cover, thus indicating a forage to cover ratio of 64:36 which is close to optimal according to the literature. Approximately 45% of the highest quality forage habitat is found in shrub/Gambel oak stands. Young, regenerating Gambel oak shoots provide an important source of browse in winter and transitional range for elk and deer. Over 100 years of fire suppression has undoubtedly reduced the availability of young Gambel oak sprouts in the area. Approximately 38% of the forage habitat is found in open canopy ponderosa pine stands with canopy closures less than 40%. The understory of many ponderosa pine stands is currently dominated by Gambel oak which provides browse forage and security cover. Thermal cover generally consists of pole-sized and larger trees in forest stands with greater than 40% canopy closure. Water sources for elk and other wildlife are limited to several small stock ponds, ephemeral, and intermittent streams, and a few widely scattered seeps and springs (mostly located on the northeastern portion of the analysis area).

The CDOW has mapped approximately 88% (12,282 acres) of the analysis area as elk winter range. Winter range is that part of the overall range of elk where 90% of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up. The Forest Plan identifies Management Area 5B as big game winter range. Approximately 11% (1,602 acres) of the area is considered 5B. An

elk migration corridor has been identified, extending from summer range in the Chalk Mountains in the South San Juan Wilderness Area, through Coyote Park. Elk production range is not mapped anywhere in the analysis area, however, there is always potential for calving in the area.

Elk are hunted during the regulated big game hunting seasons from end of August (the start of archery season) through mid-November (end of rifle season). The area generally receives moderate to high levels of hunter activity, particularly during the third and fourth rifles seasons when snow at upper elevations pushes migrating herds through the area.

The Kenney Flats (FDR 6), Valle Seco (FDR 653), and Buckles Lake (FDR 663) roads are the main motorized-access routes into the analysis area. The Big Branch Road (FDR 664) begins at the Buckles Lake Road and connects with the Blue creek Road, providing access to the northeastern portion of the area. These roads and their various open spurs provide 8.7 miles of open NFS roads within the analysis area.

Forest Plan standards and guidelines for management areas within the analysis area (4B- wildlife habitat for MIS, 5B-big game winter range, 6B-livestock grazing, and 7E-wood fiber production and utilization on gentle slopes) are being met and exceeded for movement corridors, and for hiding and thermal cover in the analysis area. Based on professional judgment, vegetative structure, and the 64:36 forage to cover ratio, existing habitat for big game exceeds 60% of its potential capability.

Based on Forest-wide elk habitat trend analyses, trend on summer range moved negatively away from optimum forage to cover ratios from 1983 to 1992, and remained stable from 1992 to 2002. The existing ratio is 36:64. Habitat trend on winter range moved negatively away from optimum forage to cover ratios from 1983 to 1992, and moved positively towards optimum from 1992 to 2002. The existing ratio is 61:39, near the optimum of 60:40.

The CDOW monitors elk populations in discrete geographic areas known as Data Analysis Units (DAUs). The analysis area is located in DAU E-31. Monitoring includes both harvest and census data to estimate population size from year to year. Currently, there are an estimated 13,903 animals in DAU-E31, slightly above the heard objective of approximately 13,500 animals.

Elk populations on the Forest have steadily grown from 33,753 individuals in 1983 to 44,496 in 1992. From 1992 to 2002 the elk population steadily decreased to 27,448, an intentional decreasing population trend to help achieve desired herd objectives set by the CDOW. Elk numbers are slightly above the population objective established by the CDOW. Over the planning period of 1983 to 2002, elk population trends do not correlate with elk habitat trends. Changes in habitat on the Forest do not appear to affect elk numbers. However, changes in habitat structure can influence elk distribution.

Green-Tailed Towhee

Though the green-tailed towhee is a fairly common bird throughout much of its range, it remains one of the more poorly known species of North American birds. Lack of knowledge of this species could be due to its secretive nature and the fact that individuals spend most of their time on or near the ground in thick, shrubby habitats (Dobbs et al 1998). The breeding habitat of the green-tailed towhee varies with elevation. Breeders prefer species-rich shrub communities within shrub-steppe habitats, and disturbed and open areas of montane forest, often created by forest fires (Dobbs et

al 1998). They can be found in thickets, chaparral, shrublands, riparian scrub and sagebrush, preferring low tree canopy cover and medium to dense shrub cover. In montane areas they are commonly found on mountain slopes, plateaus and higher valleys associated with dense shrubs 1.6 to 4.9 feet in height using dry shrubby hillsides and post-disturbance shrubby growth (Dobbs et al 1998, and Knopf et al 1990).

In Colorado, green-tailed towhees have been recorded utilizing Gambel oak, aspen/willow and spruce/aspen habitats (Dobbs et all 1998, and Winternitz 1976). The Colorado Breeding Bird Atlas partnership found the majority of green-tailed towhees on dry shrubby hillsides and sagebrush flats. The shrubs most frequently reported included snowberry, serviceberry, chokecherry, bitterbrush, mountain mahogany, squawapple, scrub oak, and sagebrush. In addition, green-tailed towhees were found in pinyon-juniper, open canopy ponderosa pine, and in riparian shrublands. They avoid dense forests except in openings and where conditions allowed shrubs to form (Bent 1968, and Righter 1998). Atlas reports show the species using shrub habitat clear to the edge of alpine (Righter 1998).

On the SJNF, green-tailed towhees are abundant on the east and west side of the Forest where they inhabit lower elevation montane shrublands comprised of mature Gambel oak and mountain mahogany (C. Schultz, pers. com). While they appear to prefer Gambel oak and ponderosa pine/Gambel oak habitats with openings of sagebrush meadows, towhees may also use aspen, pinyon-juniper, and warm-dry mixed conifer habitats containing a shrub component.

Towhee habitat is well distributed across the analysis area. Approximately 54% (7,567 acres) of the analysis area provides suitable habitat for green-tailed towhees. Shrub/Gambel oak and sagebrush habitats are considered primary habitat for towhees, and consist of 54% (4,059 acres) of the suitable habitat. Ponderosa pine/Gambel oak and warm-dry mixed conifer habitats provide 46% (3,508 acres) the suitable habitat.

Over the 20 year period of 1983 to 2002, the trend in total amount and distribution of towhee breeding habitat Forest-wide was virtually stable, showing a 0.2% per year decline.

Three independent population trend monitoring programs show towhee populations to be essentially stable (i.e. statistically, not significantly different from a stable population trend) on the SJNF, in southwestern Colorado and throughout the state of Colorado. The Forest also used habitat-specific estimates of towhee densities to calculate towhee populations Forest-wide. Habitat-specific estimates are another reliable source to estimate population trends given the relationships of towhees to suitable habitat recorded in the scientific literature. Current data shows towhee populations to be stable (0.5% increase from about 225,400 birds to about 226,500 birds) between 1983 and 2002. The combination of population trend monitoring information and habitat-specific estimates of towhee densities show towhee populations as large, stable, widely distributed, and persistent across the Forest.

Hairy Woodpecker

The hairy woodpecker is a non-migratory, primary cavity nester found year-round over much of North America. There are three subspecies of hairy woodpecker, the Pacific, the Eastern and the interior Western. The hairy woodpecker is generally found in habitats with a greater conifer component than those of the downy woodpecker which

uses more deciduous habitats. Like other woodpeckers, the hairy drills nest holes each year that benefit a suite of other species that require holes for nesting but lack the ability to make them (Winternitz 1998). In fact, 40% of montane breeding birds require nest holes, and only 8% of these are woodpeckers able to drill their own holes (Winternitz 1976, and Winternitz 1998).

Studies show that woodpeckers tend to nest in dense stands of relatively small-diameter trees (Hitchcox 1996, and Saab and Dudley 1998) and that nest trees tend to be larger in diameter than expected on the basis of randomly chosen trees (Caton 1996, Hitchcox 1996, and Saab and Dudley 1998). In general, cavity nesting birds such as the hairy woodpecker are known to use trees that are larger in diameter than average, and broken top snags more often than expected based on the availability of these trees in the environment (Hitchcox 1996). In addition, cavity nesters typically select nest sites with higher tree density than that which occurs randomly (Saab and Dudley 1998). Local data from the SJNF has shown average snag diameters selected by hairy woodpeckers are between 12 and 13.8 inches DBH (Schultz 2001). Based on the literature and local snag survey work on the SJNF and in the analysis area, these snag diameters are represented in mature and late successional coniferous forests, and aspen (HSS 4A, 4B, 4C, and 5).

Surveys were conducted in the analysis area to determine hairy woodpecker and mountain bluebird presence or absence, and to collect existing habitat information. Fifteen hairy woodpeckers were found in mature ponderosa pine stands. The results of these surveys are on file at the Pagosa Ranger District Office.

Approximately 58% (8,182 acres) of the analysis area provides suitable habitat for hairy woodpeckers. Suitable habitat is present in mature cool moist mixed conifer, warm-dry mixed conifer, aspen, ponderosa pine, and pinyon-juniper stands.

The Forest Plan sets snag density direction to ensure that sufficient habitat is maintained on the Forest for cavity nesting species. Forest Plan standards and guidelines require the protection and/or provision of 20 snags per 10 acres in all forested types in management areas 6B and 7E. Management areas 4B and 5B have the same snag protection/provision requirement, but call for 25 to 30 snags per 10 acres in all forest types. The direction also requires providing for snag replacements.

Common stand exam (CSE) data indicates there are approximately 2.2 snags (>10” DBH) per acre within the analysis area. These snags provide foraging and cavity nesting habitat for woodpeckers. However, the average density and size of snags varies across the analysis area within each cover type. For example, many ponderosa pine stands adjacent to roads have fewer than two snags per acre, specifically in the larger size classes (much greater than 10 inch DBH, i.e., 20 inch DBH and greater) most important to wildlife. Snag surveys conducted in 2002 estimated 2.7 snags per 10 acres adjacent to roads in the analysis area.

Data from the Colorado Breeding Bird Atlas Project show hairy woodpeckers to be well distributed across the SJNF. In addition, the highest abundance in the state occurred in the San Juan Mountains (Winternitz, 1998). The Forest-wide trend in amount and distribution of total hairy woodpecker habitat is virtually stable (+0.2% increase per year) based on analysis over a 20-year period of 1983 to 2002.

Three independent population trend monitoring programs show hairy woodpecker populations to be essentially stable (i.e., statistically, not significantly different from a stable population trend) on the SJNF. The trend in hairy woodpecker total population size Forest-wide is stable to slightly increasing (+0.4% increase per year) and correlates well with the stable to slightly increasing trend in total woodpecker habitat over the 20-year analysis period.

Mountain Bluebird

The breeding range of the mountain bluebird is limited to the western third of the North American continent and roughly corresponds to the mountainous portions of the continent and the western Great Plains (Price et al 1995). They reach their highest breeding abundance in the sagebrush shrublands of the central Rocky Mountains and intermountain west.

Mountain bluebirds are secondary cavity nesters that require previously constructed tree cavities for nesting. Preferred nest sites are edge habitats, open woodlands and woodlands mixed with forest openings. Mountain bluebirds also nest in recently burned forests where they, along with most other secondary cavity nesters, exhibit preference for heavily decayed, larger snags more than in proportion to their availability. Heavily decayed, broken-topped trees appear to have the highest probability of being used as a nest tree by these and other cavity nesters (Saab and Dudley 1998).

Bluebirds readily use artificial nest boxes placed in meadows, open habitats, or near human dwellings. They have high site fidelity and are relatively tolerant of human disturbance. During the breeding season mountain bluebirds feed primarily on insects captured on the ground or during short sally flights from an elevated perch.

Mountain bluebird breeding habitats include mountain grasslands, sagebrush shrublands adjacent to open coniferous forests (especially ponderosa pine and pinyon-juniper), aspen forests, alpine tundra adjacent to krummholz, spruce-fir adjacent to mountain parks, spruce-fir clearcut harvest areas, and Gambel oak or mountain mahogany shrublands (Towry 1984, Andrews and Righter 1992, Dobkin 1994, Hutto and Young 1999, Scriven 1999). The Colorado Breeding Bird Atlas project found bluebirds in 17 coniferous, deciduous, grassland and shrubland habitats (Barrett 1998). Old woodpecker holes and nest boxes were reported as accounting for most nest sites. Stand selection may be restricted by the availability of nest sites such as old woodpecker holes and natural cavities. The species prefers nesting along forest edges and in mixtures of woodland and open habitats rather than in heavily forested stands (Towry 1984, Andrews and Righter 1992, Dobkin 1994, Barrett 1998, Hutto and Young 1999) such as are found throughout the Kenney Flats area.

Approximately 11% (1,505 acres) of the analysis area provides suitable bluebird foraging habitat, while 27% (3,727 acres) of the area provides nesting habitat. However, since these birds primarily use standing dead trees in forest/grassland/shrub edge habitat and open forests stands for nesting, the actual habitat present within the analysis area is likely to be less than this estimate since openings and snags are not prevalent throughout the analysis area. The lack of large diameter snags and forest openings is likely limiting in the analysis area for bluebirds. Surveys conducted in the analysis area to determine hairy woodpecker and mountain bluebird presence or absence, revealed three mountain bluebirds detected across the survey area. Survey results are on file at

the Pagosa Ranger District Office. Forest-wide, mountain bluebird populations are probably limited primarily by the amount and distribution of suitable nesting cavities close to suitable foraging habitat, rather than by the amount of foraging habitat.

Current Forest-wide trend in the amount and distribution of total bluebird nesting and foraging habitat is virtually stable, a 0.4% decline in nesting habitat, and a 3.1% decline in foraging habitat.

Local data for the SJNF on mountain bluebird abundance, demography, and habitat characteristics are consistent with the published literature from elsewhere in the species range. Habitat-specific estimates of bluebird densities were used to calculate total bluebird population size on the Forest. This analysis determined that bluebird populations were essentially stable (a 2.4% increase from about 124,400 birds to about 127,500) between 1983 and 2002. The slight population increase was primarily due to an increase in mature aspen acreage, a habitat with relatively high densities of nesting bluebirds and available nest cavities.

Three independent population trend monitoring programs show bluebird populations to be essentially stable (i.e., statistically, not significantly different from a stable population trend) on the SJNF, in southwestern Colorado, and throughout the state of Colorado. The combination of Forest-wide population trend information and habitat-specific estimates show that mountain bluebird populations are large, stable, widely distributed, and persistent across the Forest.

Wildlife MIS Environmental Consequences

The MIS analyzed in the following section are Abert's squirrel, elk, green-tailed towhee, hairy woodpecker, and mountain bluebird. Evaluation of the action alternatives focuses on the potential impacts to these species resulting from elevated human presence during the implementation of the project, and the changes or effects to habitat caused by timber harvest, prescribed fire, road construction, road reconstruction, and road decommissioning. The temporal scale used in the discussion of direct and indirect effects is from 1-20 years (considered short-term), and greater than 20 years (considered long-term). Effects to MIS are analyzed at three scales: project area, analysis area, and Forest-level.

No Action

The analysis addresses potential effects of taking no management action, short of that which has been previously authorized in the analysis area, including prescribed fire. It must be emphasized that with no fuel treatments or ponderosa pine restoration activities, the Condition Classes within the analysis area would remain predominately 2 and 3. These Condition Classes pose an increased risk of stand replacing wildfire. Under a stand replacement wildfire event such as the 2002 Missionary Ridge Wildfire, there would be significant loss of habitat across the analysis area that would adversely affect MIS and other wildlife. Stand replacement fire would benefit post-fire adapted wildlife species such as woodpeckers in the short-term, and enhance habitat used by species associated with early successional forest conditions.

ABERT'S SQUIRREL

In the short-term, habitat quality for Abert's squirrel and other wildlife associated with mature ponderosa pine would remain similar to that described in the affected

environment section, and eventually continue to decrease in habitat quality and capability due to increased stand densities, and other structural changes described in the vegetation section. Mycorrhizal fungi tend to increase their productivity following low intensity surface fires, so accelerated fungi production may improve forage quality on ponderosa pine sites that have been previously authorized for prescribed fire. The competition induced by the dense nature of ponderosa pine stands in the analysis area would continue to foster a slow rate of progression through successional pathways to late successional (yellow-bark ponderosa pine) stages. The current even-aged structure of ponderosa stands in the analysis area would continue to be prevalent, with little or no clumpy, horizontally diverse structure. Gambel oak would continue to dominate the understory of mature pine, duff layers and fuel loading would continue to increase, and oak competition and absence of fire would preclude any appreciable amount of pine regeneration. Consequently, Abert's squirrel nesting and foraging habitat would decrease in suitability in the long-term.

The potential for stand replacement fires would continue to increase as ladder fuels further develop in the understory of ponderosa stands, and as low canopy base height, canopy connectivity, and fuel abundance is maintained. In the event of a stand replacement fire in ponderosa pine stands, Abert's squirrel habitat could be eliminated within the burned portion of the analysis area.

In the long-term, habitat for Abert's squirrel would remain less abundant than was likely to have occurred prior to aggressive timber harvests and fire suppression in the previous century. Furthermore, the risk for stand replacement fire would increase as fuel quantity builds in the understory.

ELK

In the short-term, barring wildfire or other broad-scale disturbances, the quality of year-round and winter forage would continue to decline as canopy closures increase and understory Gambel oak suppresses herbaceous plant production. In previously authorized prescribed fire units, browse production (especially Gambel oak sprouts) would become increasingly prevalent and nutrient content and productivity of grasses and forbs would be enhanced. Conversely, elk security cover may decrease somewhat throughout prescribed fire units as Gambel oak is top-killed in the understory. Ponderosa pine with scattered patches of mature oak in the understory would continue to provide sufficient hiding cover for elk.

Elk forage abundance throughout the remainder of the analysis area would decrease in the long-term as Gambel oak in the understory continues to mature and inhibit the production of herbaceous forage. The analysis area as a whole would continue to provide a diverse landscape suitable for elk, but habitat suitability and carrying capacity would decrease.

GREEN-TAILED TOWHEE

Barring widespread wildfire, insect, or disease outbreaks, habitat for the green-tailed towhee would likely remain stable in the short-term. Dense shrub/Gambel oak in dense clumps, scattered patches, and in the understories of ponderosa pine, warm-dry mixed conifer, and dry aspen sites from 1.5 to 5 feet in height are preferred habitat for towhees. Gambel oak in the understory of previously authorized prescribed fire units would be

minimally suppressed by prescribed fires and may cease to provide habitat over the short-term, one to three years. This effect would not be across every acre since typically prescribed fire burns in a mosaic pattern across the landscape. Continued prescribed fire would keep Gambel oak knocked down in the long-term, minimizing some re-establishment of towhee habitat within ponderosa pine stands. The remainder ponderosa pine/Gambel oak stands within the analysis area would continue to provide habitat for foraging and nesting towhees.

In the aftermath of potential stand replacing wildfire in ponderosa pine communities, Gambel oak and other shrubs would become dominant resulting in an increase in suitable towhee habitat.

HAIRY WOODPECKER

In the short-term, habitat for hairy woodpecker and other woodpeckers such as downy woodpecker, and northern flicker, would remain stable.

In the long-term, cavity nesters such as the hairy woodpecker, and secondary cavity nesters that use woodpecker cavities, would continue to find a scarcity of large snags and replacement trees that provide nesting and foraging habitat. Smaller diameter (<20" DBH) trees would continue to provide the majority of habitat for these birds.

In the event of stand replacement wildfire in ponderosa pine stands, woodpecker habitat would increase dramatically for a short period until trees began to fall. Since there is a distinct lack of large diameter trees in the analysis area, most of the fire-produced snags would fall within 2-5 years, essentially eliminating woodpecker habitat in severely burned areas.

MOUNTAIN BLUEBIRD

In the short-term, habitat for mountain bluebirds would remain stable and eventually steadily decrease. Snag abundance (cavity nesting habitat) and forest openings for foraging and courtship would continue to remain limited in the analysis area, barring broad-scale disturbance such as wildfire.

In the long-term nesting habitat would continue to steadily decrease. Foraging habitat would continue to decrease because of the loss of openings, increased canopy closures, and the invasion of ponderosa pine into grass-forb and open park/meadow habitat. Overall, we could see fewer mountain bluebirds in the analysis area due to the reduction of foraging habitat.

Alternatives 2, 3, and 4

The effects to MIS habitat were determined by using the Forest Vegetation Simulator (FVS) model combined with knowledge of how stand structures and HSS would change from treatment. The areas treated for each alternative are the same so the effects to MIS habitat were predicted by estimating the total habitat treated. Because the amount of area treated at a given period differs under each alternative, the amount of habitat affected (both positive and negative) and MIS response will be incremental. The analysis discusses treatment of the entire area within a 5-year period (alternative 4), and within a 20-year period alternatives 2 and 3.

For all MIS, the indirect effect associated with human disturbances across the entire analysis area are expected to be greatest under alternative 4 since the entire area will be treated the same time within a 5 year period, followed by alternative 2 since each unit will be entered four times within a 20-year period, and then alternative 3 since the area will be divided into four areas with each area being prioritized for treatment every five years. Alternative 4 will involve high intensity disturbances over a shorter period, while alternatives 2 and 3 will result in low to moderate intensity disturbances over a 20-year period.

Fuels reduction and ponderosa pine restoration objectives will be accomplished more quickly under alternative 4, followed by alternative 3 and then 2. Potential habitat benefits to MIS are therefore expected to coincide with shorter treatment periods, as stand structures slowly begin to resemble pre-settlement characteristics.

Table 14 provides a breakdown of existing habitat, habitat affected by treatment (mechanical and prescribed fire), and habitat available post-treatment. Available habitat post-treatment, is the habitat that is expected to occur across the analysis area in 20 years. Positive and negative effects to MIS within the 20-year period are discussed.

Table 14: Pre and Post Treatment(mechanical and prescribed fire), habitats by year 20 following treatment on NFS lands in the analysis area.

MIS	Existing Habitat Acres	Existing Habitat Percent of Analysis Area	Habitat Acres Affected by Treatment	Percent of Total Existing Habitat Affected by Treatment	Post-treatment Habitat Acres	Post-treatment Habitat Percent of Analysis Area
Abert's squirrel	7,228 (S) 3,823 (O)	52 (S) 27 (O)	5,624 (S) 3,469 (O)	78 (S) 91 (O)	7,227 (S) 3,384 (O)	52 (S) 24 (O)
Elk cover	4,976	36	3,935	79	4,492	32
Elk foraging	9,017	64	3,793	42	9,500	68
Elk winter range as determined by CDOW	12,282	88	7,320	60	12,282	88
Elk winter range identified as 5B in Forest Plan	1,602	11	822	51	1,602	11
Green-tailed towhee	7,567	54	3,533	47	7,764	55
Hairy woodpecker	8,182	58	5,993	73	8,181	58
Mountain bluebird foraging	1,505	11	293	19	1,791	13
Mountain bluebird nesting	3,727	27	2,354	63	4,187	30

ABERT'S SQUIRREL

Suitable habitat for Abert's squirrel is provided by ponderosa pine stands in the 4a, 4b, and 4c HSS. There is no HSS 5 (late successional or old growth) present in the analysis area. Optimal habitat for squirrels is HSS 4b and 4c, and late successional or old growth if it was present. Under all three-action alternatives, 78% of the existing suitable and 91% of the existing optimal habitat for squirrels will be treated. Approximately 48% of the existing suitable habitat will be mechanically treated, and 77% prescribed burned.

Each of the restoration alternatives is predicted by the habitat model to essentially result in no change to suitable squirrel habitat, and result in a 3% decrease in optimal habitat.

The decrease in optimal habitat is the result of reducing canopy closures in some of the mature ponderosa pine stands that currently provide optimal habitat for foraging, nesting, and cover. The model's resolution, however, is too coarse to account for the clumps and groups of ponderosa pine with interlocking canopies that will be present post-treatment, and the effects of prescribed fire in the understory. The model therefore under estimates some of the beneficial effects to ponderosa pine stand structure and corresponding beneficial effects to squirrels.

None of the effects described in the previous paragraph would be uniform within the stands that are treated. Restoration actions will result in more nest tree clumps than required by Forest Plan standards and guidelines. The combination of forest thinning and prescribed fire would provide for regeneration beneath the existing stand. This will create conditions conducive to establishing uneven-aged and diverse conditions in the stands that will provide habitat attributes ideal for squirrels and other species adapted to uneven-aged, open park-like, and clumpy ponderosa pine forests.

In the short (1-20 years) and long-term (20+years), implementation of the any of the action alternatives would increase the rate of bole diameter growth, crown expansion, and height growth in mature ponderosa pine stands, while improving the clumpiness within each stand as described above. The long-term effects on squirrel habitat will include continued improvement of tree growth (diameter and height) and increasing canopy closures in the overstory.

The resulting treatments will improve habitat, as recommended by Dodd et al (1998), for Abert's squirrel and other ponderosa pine species such as pygmy nuthatch, northern goshawk, common nighthawk, Lewis' woodpecker, and olive-sided flycatcher. These species are all adapted to live in mature, open, park-like ponderosa pine stands with increased canopy clumpiness similar to pre-settlement conditions.

Prescribed fire implemented in alternatives 3 and 4 throughout the analysis area would create a more open understory condition that appears to be preferred by squirrels and other ponderosa pine species. Under Alternative 2, however, failure to remove slash would result in large amounts of fuel scattered on the forest floor, which would decrease the ability of squirrels to forage on the forest floor. Furthermore, the amount of slash left on the ground and subjected to prescribed fire would foster fire intensity that could potentially remove the entirety of the litter layer in which mushrooms flourish. Abert's squirrels are known to consume large amounts of mushrooms in their diet (Stephenson 1975). In addition, logging slash will impede Abert's mobility to escape from predators. Finally, implementation of any of the action alternatives would reduce the fire Condition Class within treated stands from 2 or 3 to a condition class of 1 or 2. This would reduce the risk of stand replacement fire that would essentially eliminate Abert's squirrel habitat from the analysis area for decades to come.

There is potential for increased squirrel mortality in the short-term. The more open nature of residual pine stands may provide for increased predator success, and a slight reduction in Abert's squirrel survival (by how much is impossible to predict). However, this reduction may be offset by increased fecundity fostered by improved habitat conditions resulting from the restoration project. In the long-term, accelerated tree growth rates will allow the residual canopy closure to increase. As a result, squirrel survival would be expected to improve over time.

Indirect effects to Abert's squirrel are largely related to temporary displacement during activities and are expected to be greatest under alternative 4, followed by alternative 2 and then 3.

Relationship to Forest Plan direction:

Forest Plan standards and guidelines for nest tree clump retention as described in the affected environment section will be met in the short and long-term via the uneven-aged management of ponderosa pine and increased stand clumpiness. Over time, the clumpy distribution of trees in all age classes combined with increased tree size and canopy closure will provide optimal habitat for squirrels as compared to existing conditions. Nest tree clump retention will be monitored at the project level.

Relationship to Forest-level habitat and population trends:

Proposed treatments will result in no change to suitable squirrel habitat, and 3% decrease in optimal habitat. As stands continue to develop pre-settlement habitat structural characteristics, the benefits are expected to outway the slight reduction in optimal habitat. This slight reduction of optimal habitat will add negligibly to the current slightly downward optimal habitat and population trends Forest-wide. In the future, we expect to see these trends shift upward and squirrel habitat continues to be improved through restoration treatments. Abert's squirrel population trend will continue to be monitored at the Forest-scale.

ELK

Under all three action alternatives, approximately 42% of the total elk foraging habitat, 79% cover, 69% of winter range as identified by the CDOW, and 51% of the winter range described in 5B of the Forest Plan will be treated. Forest thinning combined with prescribed burning will promote a more open stand condition by decreasing canopy closures and reduce stocking in ponderosa pine stands, allowing more sunlight to reach the surface and increasing grass-forb presence and ponderosa pine regeneration. Prescribed fire will increase grass-forb vegetation along with nutrient content. Several studies have concluded that an increase in forage quantity is more significant that increases in quality. Site preference studies show that elk usually prefer to graze on burned as opposed to unburned sites (Canon 1985, Canon et al 1987, Leege 1968, Lowe1975, Lowe et al 1978, Lyon 1976).

As predicted by the habitat model, the existing forage to cover ratio of 64:36 would be unchanged under the No Action Alternative, but converted to a ratio of 68:32 for each action alternative. A ratio of 60:40 is considered optimal for elk and deer. All three action alternatives would slightly move the analysis area away from optimal habitat, with foraging increasing by 4% and cover decreasing by 4%. Alternative 4 will be most impacting on cover followed by alternative 3 and then 2. Alternative 4 will enhance forage during the shortest period, followed by alternative 3 and then 2. In the short-term (1-20 years) the obstruction caused by slash left lying on the ground under alternative 2 may inhibit elk movement and the production of forage in the understory of treated stands. In addition, prescribed fires under alternative 2 would burn hotter as a result of slash on the ground, potentially decreasing forage production for several years.

Prescribed fire activities under all alternatives would generally improve forage quality and quantity in Gambel oak stands located in winter range.

Indirect effects to elk are largely related to temporary displacement during activities and are expected to be greatest under alternative 4, followed by alternative 2 and then 3.

Relationship to Forest Plan direction:

Standards and guidelines in the Forest Plan would ensure that wildlife habitat would be conserved within the analysis area. Relevant standards and guidelines include the following:

Maintain habitat capability of at least 40 percent in 7E, 60% in 6B, and 80% in 5B
Maintain habitat effectiveness of 90 percent on winter range 5B.
Maintain a wildlife movement corridor at least 600 feet and capable of hiding 90 percent of an elk or deer at 200 feet in each ½ square mile where vegetation treatment projects occur.

Elk habitat capability is expected to be maintained and would not be appreciably affected under any action alternative. Newly constructed access roads proposed under alternatives 3 and 4 will be closed following project activities. Coordination with the CDOW would assure that seasonal restrictions, if necessary, would be placed in project areas within winter range. The slight reduction of elk cover is not expected to affect elk given that cover is not a limiting factor in the general area elk seasonally occupy within an adjacent to the analysis area. The forage to cover ratio of 64:32 is slightly less that optimal, but again, this accounts for a small portion of the available elk habitat in the general area. Forage condition on winter range is expected to be enhanced though prescribed burning.

Relationship to Forest-level habitat and population trends:

Since 1992, the trend in elk forage to cover has remained stable across the SJNF, with a ratio of 36:64. The proposed action will slightly help the existing Forest-wide forage to cover ratio, by adding a 4% increase in forage. However, elk cover is very abundant across the Forest, and as stands continue to mature in both tree size and density, so will cover. There are many locations across the Forest that are not accessible due to topography, are management for their roadless character, or are within designated Wilderness Areas, thereby, are not susceptible to human manipulation.

Elk populations across the SJNF and in DAU E-31 are doing very well. The CDOW has implemented shifts in management direction to help reduce elk populations to meet desired herd objectives, resulting in an intentional downward trend in the population across the Forest. The proposed action will have benefits to elk resulting from improved foraging habitat in the short and long-term. This potential benefit, along with a slight reduction of cover will have negligible impacts to the current intentional decreasing elk population trend Forest-wide. The proposed action will have no influence on the elk population in Elk DAU-E31 which is currently above the herd objective. The Forest will continue coordination with the CDOW in order to monitor elk population trends at the Forest-level and herd objectives as the DAU level.

GREEN-TAILED TOWHEE

Under all three action alternatives, approximately 47% of the existing green-tailed towhee habitat will be treated. As predicted by the habitat model, proposed treatment will result in a 1% increase in towhee habitat across the analysis area. This minor increase

would result from an increase in ponderosa pine HSS 4A and a more open stand condition preferred by towhees.

We expect to see an incremental minor increase in towhee habitat under each alternative. Alternative 4 is expected to show the quickest benefit to towhees followed by alternative 3 and then 2. This increase in towhee habitat is the result of increased Gambel oak and other shrubs by reducing stem densities in the lower and mid canopy ponderosa pine and small openings in the interior forest. In actuality, however, modeling results do not address habitat preference. Although towhees do utilize ponderosa pine/Gambel oak stands, especially in openings created by fire or other disturbance, they are far more common in pure Gambel oak and other mountain shrub habitats. As a result, the increase in habitat acreage in ponderosa pine HSS 4A would not likely mean an equal increase in towhee numbers.

Prescribed fire across approximately 1,145 acres (15% of existing), and mechanical treatment of 242 acres (3% of existing) in optimal Gambel oak habitat for towhees would more directly affect habitat and towhee numbers. Prescribed fire in Gambel oak stands would initially reduce towhee habitat beginning the first year, until about year three depending on oak response. The rapid regeneration of root-sprouting Gambel oak that is expected to follow prescribed fire would begin mitigating this impact by year three and thereafter. Burning in Gambel oak stands is usually conducted in a manner that top kills a portion of the oak to reduce its ladder fuel ability, especially when associated with ponderosa pine and other conifers. Large clumps of mature oak are normally maintained, by controlling the amount of fire released from a drip torch under open grassy mature oak understories and due to the mosaic burning pattern.

In the long-term (20+ years), pure Gambel oak stands would increase in structural complexity as a result of the patchy nature of prescribed fires. Since avian species typically respond positively to increased structural complexity, towhee habitat would be expected to improve over the long-term as a result of prescribed fire in Gambel oak.

Short-term indirect effects to towhees may occur as birds are temporarily displaced as a result of prescribed fire and mechanical treatments. This displacement would be temporary, no more than three years. In the long-term, there are no indirect effects predicted for the towhee.

Relationship to Forest Plan direction:

Standards and guidelines for green-tailed towhee involve maintaining habitat capability of at least 40% in 5B and 7E, 60% in 6B, and 80% of potential capability in 4B management areas. Given the abundance of shrub/Gambel oak present for breeding towhees in the analysis area, habitat capability is meeting or exceeding standards and guidelines. Proposed treatment will increase suitable towhee habitat by 1% despite, the 15% reduction of optimal towhee habitat for up to three years following prescribed burning and mowing in Gambel oak stands. Past activities such as timber harvest and fire suppression have led Gambel oak and other shrubs to become more predominant across the area, consequently, the area contains much more towhee habitat than would be present under a natural condition.

Relationship to Forest-level habitat and population trends:

Given the small amount of towhee habitat treated, the 1% increase in towhee habitat (includes the up to 3 year affect on 18% optimal habitat) will have negligible effects to

the current stable habitat and population trend Forest-wide. As prescribed fire treatments occur within ponderosa pine stands with a Gambel oak understory, there will be less towhee habitat in the long-term (30+ years). Prescribed burning will maintain structural diversity in pure Gambel oak stands, therefore maintaining towhee habitat in the long-term. These effects are likely to offset each other and as a consequence, the towhee population will likely remain unchanged. Green-tailed towhees will continue to be monitored at the Forest-scale.

HAIRY WOODPECKER

Under all three action alternatives, approximately 73% of the total available hairy woodpecker habitat will be treated. As predicted by the habitat model, there will be no change in hairy woodpecker habitat in the short-term. This estimate is based on proposed activities that would not reduce or remove standing dead trees in ponderosa pine stands.

In the long-term, restoration activities would result in larger tree growth leading to larger diameter snags and snag replacements than would likely exist under the No Action Alternative. As a consequence, habitat for hairy woodpeckers would benefit directly from restoration treatments. In addition, ponderosa pine trees that are heavily scorched by prescribed fire would often die within 3 years following treatment. This will help increase the standing dead component in the analysis area. More standing dead creates increased nesting and forage opportunities for woodpeckers and secondary cavity nesters. As a consequence, woodpecker habitat quality will improve across the treated areas.

Indirect effects to hairy woodpeckers are largely related to temporary displacement during activities and are expected to be greatest under alternative 4, followed by alternative 2 and then 3.

Relationship to Forest Plan direction:

Forest Plan standards and guidelines require the protection and/or provision of 20 snags per 10 acres in all forested types in management areas 6B and 7E. Management areas 4B and 5B have the same snag protection/provision requirement, but call for 25 to 30 snags per 10 acres in all forest types. The direction also requires providing for snag replacements. Currently, the analysis area is meeting the minimum snag requirements of 20 snags per 10 acres in 6B and 7E, with current densities averaging 2.2 snags (>10” DBH) per acre. However, the area lacks large diameter ponderosa pine snags preferred by most cavity nesters, and snag distribution is poor in portions of the area. Proposed treatment along with current drought and insect activity will help increase snag densities and replacements for hairy woodpecker and other cavity nesters. No snags, regardless of size, will be cut with the exception meeting OSHA safety standards. The density and abundance of snags will continue to be monitored within the analysis area to determine availability and use by woodpeckers.

Relationship to Forest-level habitat and population trends:

The proposed action will result in no change to hairy woodpecker habitat in the analysis area. However, larger trees are expected to become more abundant in the short and long-term providing more suitable snags and replacement for cavity nesting. An increase in suitable snags should correspond to an increasing woodpecker population in

the analysis area. The improved snag condition, along with current drought and insect activity will incrementally increase habitat quality across the Forest and begin shifting to an upward habitat trend. Proposed treatment will not affect the current stable Forest-wide population trend of hairy woodpeckers, but we could see a shift to an upward population trend paralleling the upward shift in habitat trend. Hairy woodpecker population trend will continue to be monitored at the Forest-scale.

MOUNTAIN BLUEBIRD

Under all three action alternatives, approximately 19% of the total mountain bluebird foraging habitat, and 63% of the total nesting habitat will be treated. As predicted by the model, there will be a 2% increase in foraging habitat and a 3% increase in nesting habitat for bluebirds. These figures, produced solely on the basis of gross habitat parameters, are most likely understated. Mountain bluebirds forage in forest openings and nest in forest edge habitat (Kingery 1998), such as that which would be created by the 0.2 – 2.0 acre improvement cuts proposed under all action alternatives. As a consequence, habitat would be dramatically improved for mountain bluebird, under all action alternatives, at a scale that is not reflected in the rather coarse filter used in the habitat model.

In the distant long-term (20+ years) restoration activities would result in the creation of larger diameter snags and snag replacements than would likely exist under the No Action Alternative. As a consequence habitat quality will increase for hairy woodpeckers and other primary cavity nesters directly benefiting mountain bluebirds and other secondary cavity nesters.

Indirect effects to mountain bluebird are largely related to temporary displacement during activities and are expected to be greatest under alternative 4, followed by alternative 2 and then 3.

Relationship to Forest Plan direction:

Same as hairy woodpecker.

Relationship to Forest-level habitat and population trends:

The proposed action will result in a 2% increase in foraging habitat and 3% increase in nesting habitat for mountain bluebirds. These beneficial effects will add positively to the current stable nesting and foraging habitat trend at the Forest-scale.

THREATENED, ENDANGERED, AND SENSTIVE FISH AND WILDLIFE SPECIES

Affected Environment

Federal Threatened and Endangered Species

The Forest Service Manual (FSM 2672.4) provides direction to evaluate the effects of a proposed action on any species federally listed or proposed for listing under the Endangered Species Act (ESA) of 1973, as amended. Additionally, Section 7 of the ESA requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened or endangered species, or result in the destruction or adverse modification of their critical habitats. Interagency cooperation between the USFS and the USDI Fish and Wildlife Service (USFWS) regarding proposed, threatened, or endangered species is described in

Section 7 of the ESA. Federal actions that affect listed species must undergo consultation or conference with the USFWS. Definitions related to consultation and conference is given in the Endangered Species Act Consultation Handbook, Procedures for Conducting Section 7 Consultation and Conferences (USDI Fish and Wildlife Service, 1998).

An endangered species is a species listed by the USFWS because it is in danger of extinction throughout all or a significant portion of its range. A threatened species is a species that is considered by the USFWS as likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. A proposed species is a species that has been proposed by the USFWS to be listed as threatened or endangered. Table 15 lists federally listed fish and wildlife species and federal candidates for the San Juan National Forest (SJNF), habitat used, and habitat presence and probability of species occurrence in the analysis area (USDI Fish and Wildlife Service, 2004)

Table 15: federally listed fish and wildlife species and federal candidates for the San Juan National Forest

Species	Status	Habitat	Habitat Present In the Analysis Area, and Use Period	Probability of Occurrence in the Analysis Area (based on habitat suitability, or known or historic observations/occurrences)
Amphibians (1)				
Boreal toad (*Bufo boreas boreas*)	Federal Candidate	Damp conditions in the vicinity of marshes, wet meadows, streams, beaver ponds, glacial kettle ponds, and lakes interspersed in subalpine forest (lodgepole pine, Engelmann spruce, subalpine fir, and aspen). Sometimes found where ponderosa pine is present. Elevational range is mainly 8,500 ft. to 11,500 ft. with higher and lower occurrences in some areas.	No	None
Birds (5)				
Bald eagle (*Haliaeetus leucocephalus*)	Threatened	Reservoirs and rivers. In winter, may also occur locally in semideserts and grasslands, especially near prairie dog towns.	No	None - Low, bald eagles are primarily fall and winter residents on the SJNF. There are no nests in the analysis area or are there any water sources containing fish or prairie dog colonies that would provide foraging habitat. Eagles may pass through the area in route to suitable habitat locations.
Mexican spotted owl (*Strix occidentalis lucida*)	Threatened	Mixed conifer habitat (Douglas-fir, ponderosa pine, white fir) located in steep rock walled canyons. All known Mexican spotted owl pairs in Colorado use canyon habitats for nesting.	No	None
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered	Willow riparian with patch size 30 ft. x 30 ft. x 5 ft. tall, up to ¼ acre or larger.	No	None
Yellow-billed cuckoo (*Coccyzus americanus*)	Federal Candidate	Low elevation willow riparian and cottonwood.	No	None
Fish (4)				
Bonytail (*Gila elegans*)	Endangered	Colorado River; affected by water depletions from the Colorado River Basin.	No	None
Colorado pikeminnow (*Ptychocheilus lucius*)	Endangered	Lower San Juan and Colorado Rivers; affected by water depletions from both basins.	No	None
Humpback chub (*Gila cypha*)	Endangered	Colorado River; affected by water depletions from the Colorado River Basin.	No	None

Razorback sucker (*Xyrauchen texanus*)	Endangered	Lower San Juan and Colorado Rivers; affected by water depletions from both basins.	No	None
Insects (1)				
Uncompahgre fritillary butterfly (*Boloria acrocnema*)	Endangered	Snow willow located in alpine habitat.	No	None
Mammals (1)				
Canada lynx (*Lynx canadensis*)	Threatened	Spruce-fir, cool-moist mixed conifer, high elevation aspen mixed with spruce-fir or cool-moist mixed conifer, and willow riparian adjacent to the above habitats.	Yes	Low

Forest Service Sensitive Species

The Forest Service has developed policy regarding the designation of sensitive species, and to ensure they receive full consideration throughout the NEPA planning process (Forest Service Manual 2600, Chapter 2670, Rocky Mountain Region [Region 2]; Supplement No. 2600-2003-1). Eight criteria were considered and evaluated to determine whether a species merited sensitive status in the Rocky Mountain Region (R2 Supplement 2600-2003-1, 2672.11). These criteria included 1) geographic distribution within the Region, 2) geographic distribution outside the Region, 3) capability of the species to disperse, 4) abundance of the species in the Region, 5) population trend in the Region, 6) habitat trend in the Region, 7) vulnerability of habitats in the Region, and 8) life history and demographic characteristics of the species. Upon applying the criteria to species across the Region, a revised sensitive species list was completed which became effective December 1, 2003. The SJNF has since reviewed the Regional sensitive species list and identified species that occur, are suspected of occurring, or have habitat present on the Forest. Sensitive species with habitat present in the analysis area are described in Table 16. Specific information regarding the species life history information, status, distribution, etc. is referenced in the Biological Evaluation (BE).

From the Regional Forester's sensitive species list, 31 fish and wildlife species are known to occur, suspected to occur, or have habitat present on the Forest (Table 16). This includes two amphibians, 18 birds, 4 fish, one insect, and six mammals. Table 16 describes brief habitat descriptions, habitat presence in the analysis area and period of use, probability of occurrence in the analysis area, and whether the species is evaluated in the BE. Habitat descriptions were taken from Hammerson (1999), Andrews and Righter (1992), Fitzgerald et al. (1994), and Page and Burr (1991).

The primary vegetation types that provide habitat for wildlife in the analysis area include ponderosa pine, shrub/Gambel oak, grass-forb parks/openings, warm-dry mixed conifer, and aspen. Other vegetation types present, but less abundant include cool-moist mixed conifer, riparian, and sagebrush. There are no marshes, wetlands, lakes or reservoirs present in the analysis area with the exception of Spence Reservoir on private land. Additionally, there are no waterfalls or large flowing rivers or streams in the analysis area.

As mentioned in Table X, many species utilize habitats that are not present, or no known populations exist in the analysis area. The proposed action will therefore have no impact on the following species: boreal toad, American bittern, black swift, boreal owl, burrowing owl, Columbian sharp-tailed grouse, northern harrier, short-eared owl, white-tailed ptarmigan, bluehead sucker, Colorado River cutthroat trout, flannelmouth sucker, roundtail chub, Great Basin silverspot, Gunnison's prairie dog, river otter, and wolverine. These species are dismissed from further analysis.

Activities associated with the proposed action will avoid the limited amount of habitat present in the analysis area (no treatment proposed in habitat, or areas will be avoided through project design criteria or implementation of Forest Plan Standards and Guidelines) for the Brewer's sparrow, ferruginous hawk, loggerhead shrike, purple martin, and American marten. Consequently, the proposed action will have no impact on these species, and are therefore dismissed from further analysis (Table 16).

Based on the vegetation types present in the analysis area, riparian areas, and man made structures such as stock ponds, habitat is present for the following nine species: northern leopard frog, American peregrine falcon, American three-toed woodpecker, flammulated owl, Lewis' woodpecker, northern goshawk, olive-sided flycatcher, spotted bat, and Townsend's big-eared bat. These nine species are addressed in the BE.

Table 16: Forest Service Region 2 sensitive species known to occur, suspected to occur, or with habitat present on the SJNF (USDA Forest Service, 2004X).

Species	Habitat	Habitat Present In the Analysis Area, and Use Period	Probability of Occurrence in the Analysis Area (based on habitat suitability, or known or historic observations/occurrences)	Species Evaluated
Amphibians (2)				
Boreal toad *(Bufo bor eas boreas)*	Damp conditions in the vicinity of marshes, wet meadows, streams, beaver ponds, glacial kettle ponds, and lakes interspersed in subalpine forest (lodgepole pine, Engelmann spruce, subalpine fir, and aspen). Sometimes found where ponderosa pine is present. Elevational range is mainly 8,500 ft. to 11,500 ft. with higher and lower occurrences in some areas.	No, there are no marshes, beaver ponds, wet meadows, etc. present in the analysis area.	None	No, there is no habitat present in the analysis area for boreal toads. The proposed action will have no impact on the boreal toad. No further discussion required.
Northern leopard frog (*Rana pipiens*)	Wet meadows and the banks and shallows of marshes, ponds, glacial kettle ponds, beaver ponds, lakes, reservoirs, streams, and irrigation ditches. Generally found at the waters edge. Elevation range extends up to 11,000 ft in southern Colorado.	Yes, some potential breeding habitat in stock ponds and the adjacent Spence Reservoir located on private land. The species is active during spring and summer.	High, northern leopard frogs have been found in the analysis area.	No, see effects of the proposed action on species evaluated.

Table 16: Forest Service Region 2 sensitive species known to occur, suspected to occur, or with habitat present on the SJNF (USDA Forest Service, 2004X).

Species	Habitat	Habitat Present In the Analysis Area, and Use Period	Probability of Occurrence in the Analysis Area (based on habitat suitability, or known or historic observations/occurrences)	Species Evaluated
Birds (18)				
American bittern (*Botaurus lentiginosus*)	Cattail marshes and sometimes in adjacent wet meadows. Rarely seen outside of marshes around lakes and in riparian areas, primarily in spring and fall migration.	No, there are no marshes, or wet meadows present in the analysis area.	None	No, there is no habitat present in the analysis area for American bitterns. The proposed action will have no impact on the American bittern. No further discussion required.
American peregrine falcon (*Falco peregrinus anatum*)	Breeding pairs nest on cliffs and forage over adjacent coniferous and riparian forests, and at times other habitats. Migrants and winter residents occur mostly around reservoirs, rivers, and marshes, grasslands, and agricultural areas.	Yes, foraging habitat across the analysis area primarily in grass-forb parks and riparian areas. Spring – Fall	High, based on habitat present for foraging in the analysis area, and a known eyrie approximately 7 air miles east of the analysis area.	Yes
American three-toed woodpecker (*Picoides dorsalis*)	Primarily spruce-fir forests, but where insect populations are high it may also occur in ponderosa pine, Douglas-fir, and lodgepole pine forests.	Yes, cool-moist mixed conifer, warm-dry mixed conifer, and ponderosa pine habitat. There is currently no infestation of insects (bark beetles). Year-round	Low to moderate, because there is currently no infestation of insects (bark beetles) in the analysis area. Three-toed woodpeckers generally prefer higher elevation spruce-fir and mixed conifer habitats where they feed on bark beetles and larvae.	Yes
Black swift (*Cypseloides niger*)	Nest on precipitous cliffs near or behind high waterfalls. Foraging birds range at high elevations widely over most montane and adjacent lowland habitats.	No, there are no waterfalls present in or near the analysis area.	None	No, there is no habitat present in the analysis area for black swifts. The proposed action will have no impact on the black swift. No further discussion required.
Boreal owl (*Aegolius funereus*)	Mature spruce-fir or spruce-fir/lodgepole pine with meadows.	No, there is no spruce-fir present in the analysis area.	None	No, there is no habitat present in the analysis area for boreal owls. The proposed action will have no impact on the boreal owl. No further discussion required.
Brewer's sparrow *(Spizella breweri)*	Breeds primarily in sagebrush shrublands, but also other shrublands such as mountain mahogany or rabbitbrush.	Yes, a limited amount of sagebrush habitat (9 acres). Spring – Summer	Low, based on the limited amount of sagebrush habitat present in the analysis area.	No, the proposed action will not affect the limited amount of sagebrush habitat for Brewer's sparrow. The proposed action will have no impact on the Brewer's sparrow.
Burrowing owl *(Athene cunicularia)*	Grasslands; usually in or near prairie dog towns.	No, there are no short grass grasslands or prairie dog towns present in the analysis area.	None	No, there is no habitat present in the analysis area for burrowing owls. The proposed action will have no impact on the burrowing owl.

Table 16: Forest Service Region 2 sensitive species known to occur, suspected to occur, or with habitat present on the SJNF (USDA Forest Service, 2004X).

Species	Habitat	Habitat Present In the Analysis Area, and Use Period	Probability of Occurrence in the Analysis Area (based on habitat suitability, or known or historic observations/occurrences)	Species Evaluated
				No further discussion required.
Columbian sharp-tailed grouse *(Tympanuchus phasianellus columbianus)*	Gambel oak and serviceberry shrublands, often interspersed with sagebrush shrublands, aspen forests, wheatfields, and irrigated meadows and alfalfa fields. To be restored by Colorado Division of Wildlife (CDOW) starting in 2004. Currently not on Columbine or Pagosa Ranger Districts. Dolores may retain some habitat.	No, the species does not occur on the Pagosa Ranger District.	None	No, there is no habitat present in the analysis area for Columbian sharp-tailed grouse. The proposed action will have no impact on the Columbian sharp-tailed grouse. No further discussion required.
Ferruginous hawk (*Buteo regalis*)	Grasslands and semidesert shrublands, and rare in pinyon-juniper woodlands.	Yes, a limited amount of pinyon-juniper habitat (91 acres). There are no short grass grasslands or semidesert shrublands present in the analysis area. Possible fall migrant through the area.	Low, based on the limited amount of pinyon-juniper habitat present in the analysis area. The species is rare in pinyon-juniper woodlands.	No, the proposed action will not affect the limited amount of pinyon-juniper habitat for ferruginous hawks. The proposed action will have no impact on the ferruginous hawk. No further discussion required.
Flammulated owl (*Otus flammeolus*)	Old growth or mature ponderosa pine and ponderosa-Douglas-fir forests, often mixed with mature aspen; pure aspen; and old growth pinyon-juniper woodlands.	Yes, mature ponderosa pine and warm-dry mixed conifer habitat. Spring - Summer	High, flammulated owls have been found in the analysis area.	Yes
Lewis' woodpecker (*Melanerpes lewis*)	Lowland and foothill riparian forests, agricultural areas, edges of ponderosa pine stands and urban areas with tall deciduous trees; rarely in pinyon-juniper woodlands.	Yes, habitat is present across the entire analysis area. Spring - Fall	High, Lewis' woodpeckers have been observed in the analysis area.	Yes
Loggerhead shrike (*Lanius ludovicianus*)	Sagebrush and occasionally oakbrush with big well developed openings of grasslands, agricultural areas, semi-desert shrublands, and sometimes open pinyon-juniper woodlands; breeding birds	Yes, a limited amount of sagebrush (9 acres) and pinyon-juniper (91 acres) habitat. Grasslands and oakbrush present	Low to moderate, based on the limited amount of sagebrush and pinyon-juniper habitat present in the analysis area.	No, the proposed action will not affect the limited amount of sagebrush or pinyon-juniper habitat for loggerhead shrikes. The proposed action will have no impact on the loggerhead shrike.

Table 16: Forest Service Region 2 sensitive species known to occur, suspected to occur, or with habitat present on the SJNF (USDA Forest Service, 2004X).

Species	Habitat	Habitat Present In the Analysis Area, and Use Period	Probability of Occurrence in the Analysis Area (based on habitat suitability, or known or historic observations/occurrences)	Species Evaluated
	are usually near isolated trees or large shrubs.	in the analysis area are primarily associated with or adjacent to ponderosa pine and warm-dry mixed conifer as opposed to lower elevation sagebrush, semidesert shrublands, short grass grasslands, or agricultural areas. Spring – Fall		
Northern goshawk (*Accipiter gentilis*)	Mature deciduous, coniferous and mixed forests year-round.	Yes, aspen, cool-moist mixed conifer, warm-dry mixed conifer, and ponderosa pine habitat. Spring – Fall	High, one known goshawk territory is present in the analysis area.	Yes
Northern harrier (*Circus cyaneus*)	Grasslands, shrublands, wetlands, agricultural, and alpine tundra in fall.	No, there are no short grass grasslands, marshes, shrub steppe, alpine, or agricultural lands present in the analysis area.	None	No, there is no habitat present in the analysis area for northern harriers. The proposed action will have no impact on the northern harrier.
Olive-sided flycatcher (*Contopus cooperi)*	Breeds primarily in mature spruce-fir and Douglas-fir forests, especially on steep slopes or near cliffs, and less often in other types of coniferous forests, montane and foothill riparian, and aspen forests; burned areas.	Yes, open stands of aspen, ponderosa pine, and warm-dry mixed conifer. Spring – Summer	High, the species has been observed in the analysis area.	Yes
Purple martin (*Progne subis*)	Old growth and mature aspen forests near parks and generally near water; mixed aspen/ponderosa pine or aspen/Douglas-fir forests.	Yes, marginal aspen habitat. Possible summer use	Low, aspen habitat present in the analysis area is marginal due to the juxtaposition to parks and water sources.	No, the proposed action will not affect the limited amount of marginal aspen habitat for purple martins. The proposed action will have no impact on the purple martin. No further discussion required.
Short-eared owl (*Asio flammeus*)	Open habitats including grasslands, marsh edges, shrub-steppes and agricultural lands.	No, there are no short grass grasslands, marshes, shrub steppe, or agricultural lands present in the	None	No, there is no habitat present in the analysis area for short-eared owls. The proposed action will have no impact on the short-eared owl. No further discussion required.

Table 16: Forest Service Region 2 sensitive species known to occur, suspected to occur, or with habitat present on the SJNF (USDA Forest Service, 2004X).

Species	Habitat	Habitat Present In the Analysis Area, and Use Period	Probability of Occurrence in the Analysis Area (based on habitat suitability, or known or historic observations/occurrences)	Species Evaluated
		analysis area.		
White-tailed ptarmigan *(Lagopus leucurus)*	Alpine tundra. Areas that are mostly snowfree early in the season are used for breeding and females with broods generally occur on rocky, wet tundra. Males generally winter above timberline in areas of short willow thickets, while females often winter at or below timberline in taller, denser willow thickets and along willow-dominated watercourses.	No, there is no alpine habitat present in the analysis area.	None	No, there is no habitat present in the analysis area for white-tailed ptarmigans. The proposed action will have no impact on the white-tailed ptarmigan. No further discussion required.
Fish (4)				
Bluehead sucker (*Catostomus discobolus*)	Rocky riffles and runs of small to large rivers in the Upper Colorado and San Juan River drainages.	No, there are no streams containing fish in the analysis area.	None	No, there is no habitat present in the analysis area for bluehead suckers. The proposed action will have no impact on the bluehead sucker. No further discussion required.
Colorado River cutthroat trout (*Onchorynchus clarki pleuriticus*)	Upper reaches of specific streams in the Colorado River drainage including the San Juan National Forest.	No, there are no streams containing fish in the analysis area.	None	No, there is no habitat present in the analysis area for Colorado River cutthroat trout. The proposed action will have no impact on the Colorado River cutthroat trout. No further discussion required.
Flannelmouth sucker (*Catostomus latipinnis*)	Rocky pools, runs, and riffles of medium to large rivers; less often in creeks and small rivers, in the Upper Colorado and San Juan River drainages.	No, there are no streams containing fish in the analysis area.	None	No, there is no habitat present in the analysis area for flannelmouth suckers. The proposed action will have no impact on the flannelmouth sucker. No further discussion required.
Roundtail chub (*Gila robusta*)	Rocky runs, sometimes pools, of creeks and small to large rivers; sometimes common in impoundments in the Upper Colorado and San Juan River drainages.	No, there are no streams containing fish in the analysis area.	None	No, there is no habitat present in the analysis area for roundtail chubs. The proposed action will have no impact on the roundtail chub. No further discussion required.
Insects (1)				
Great Basin silverspot (*Speyeria nokomis nokomis*)	Moist meadows, seeps, marshes, and streamsides primarily below 7,500 ft.	No, there are no moist meadows, seeps, marshes, or streamsides in the analysis area.	None	No, there is no habitat present in the analysis area for Great Basin silverspots. The proposed action will have no impact on the Great Basin silverspot. No further discussion required.

Table 16: Forest Service Region 2 sensitive species known to occur, suspected to occur, or with habitat present on the SJNF (USDA Forest Service, 2004X).

Species	Habitat	Habitat Present In the Analysis Area, and Use Period	Probability of Occurrence in the Analysis Area (based on habitat suitability, or known or historic observations/occurrences)	Species Evaluated
Mammals (7):				
American marten (*Martes americana*)	Spruce-fir and mesic coniferous forests with complex physical structure on the ground.	Yes, cool-moist mixed conifer habitat (282 acres) Limited year-round	Low to moderate based on the limited amount of suitable habitat present.	No, the proposed action will not affect cool-moist mixed conifer habitat for American marten. The proposed action will have no impact on the American marten.
Gunnison's prairie dog (*Cynomys gunnisoni*)	Grasslands, semidesert and montane shrublands	No, there are no prairie dog colonies in the analysis area.	None	No, there is no habitat present in the analysis area for Gunnison's prairie dogs. The proposed action will have no impact on the Gunnison's prairie dog. No further discussion required.
River otter (*Lontra canadensis*)	Specific drainages with fish across the SJNF including the San Juan River, Animas River, Piedra River, Los Pinos River, Florida River, and Dolores River.	No, there are no streams containing fish in the analysis area.	None	No, there is no habitat present in the analysis area for river otters. The proposed action will have no impact on the river otter. No further discussion required.
Spotted bat *(Euderma maculatum)*	Ponderosa pine, pinyon-juniper woodlands, and open semidesert shrublands; Rocky cliffs are necessary to provide suitable cracks and crevices for roosting, as is access to water.	Yes, potential foraging habitat across the analysis area. Spring – Summer	Moderate - High	Yes
Townsend's big-eared bat (*Corynorhinus townsendii*)	Semidesert shrublands, pinyon-juniper woodlands, and open montane forests up to 9,500 ft. elevation; associated with caves and abandoned mines for day roosts and hibernacula but also uses abandoned buildings and crevices on rock cliffs for refuge.	Yes, potential foraging habitat across the analysis area. Spring – Summer	None	Yes
Wolverine (*Gulo gulo*)	Alpine, spruce-fir; remote areas with limited disturbance.	No, there is no alpine or spruce-fir habitat in the analysis area.	None	No, there is no habitat present in the analysis area for wolverines. The proposed action will have no impact on the wolverine. No further discussion required.

Environmental Consequences

Federal Threatened and Endangered Species

A Biological Assessment (BA) has been prepared that addresses project affects to federally listed species with habitat present on the San Juan National Forest. The Canada lynx is the only species with habitat present in the analysis area. The proposed action will have no effect on lynx or lynx habitat. Additionally the proposed action will

have no effect on the boreal toad, bald eagle, Mexican spotted owl, southwestern willow flycatcher, yellow-billed cuckoo, bonytail, Colorado pikeminnow, humpback chub, razorback sucker, or Uncompahgre fritillary butterfly. More detailed information on the analysis conducted and project affects determinations can be found in the BA.

Forest Service Sensitive Species

A Biological Evaluation (BE) has been prepared that addresses project impacts on San Juan National Forest Sensitive species with habitat present in the analysis area. Below is a summary of the impact determinations. More detailed information on the analysis conducted and project impact determinations can be found in the BA.

A no impact determination was made for the following species: boreal toad, American bittern, black swift, boreal owl, burrowing owl, Columbian sharp-tailed grouse, northern harrier, short-eared owl, white-tailed ptarmigan, bluehead sucker, Colorado River cutthroat trout, flannelmouth sucker, roundtail chub, Great Basin silverspot, Gunnison's prairie dog, river otter, and wolverine. There will be no impact on these since there is in habitat or populations present in the analysis area.

Activities associated with the proposed action will avoid the limited amount of habitat present in the analysis area (no treatment proposed in habitat, or areas will be avoided through project design criteria or implementation of Forest Plan Standards and Guidelines) for the Brewer's sparrow, ferruginous hawk, loggerhead shrike, purple martin, and American marten. Consequently, the proposed action will have no impact on these species.

Activities associated with the proposed action will have no impact on the American peregrine falcon.

Activities associated with the proposed action may adversely impact individual northern leopard frogs, American three-toed woodpecker, flammulated owl, Lewis' woodpecker, northern goshawk, olive-sided flycatcher, spotted bat, and Townsend's big eared bat.

BIRDS OF CONSERVATION CONCERN

Affected Environment

Birds of Conservation Concern (BCC) are birds identified by the U.S. Fish and Wildlife Service (USFWS) that are migratory and non-migratory birds of the United States and its territories that are of conservation concern. The concerns may be the result of population declines, naturally small ranges or population sizes, threats to habitat, or other factors. The intent of the BCC program is to prevent or remove the need to consider listing species under ESA, and promote and conserve long-term avian diversity in the United States. Table 17 lists BCC for the Southern Rockies/Colorado plateau geographic area, and habitat presence within the analysis area.

Table 17: Birds of Conservation Concern for Region 16: Southern Rockies/Colorado Plateau (USDI Fish and Wildlife Service, 2002), and habitat presence in the analysis area.

Species	Habitat	Status on San Juan Public Lands	Habitat Present in the Analysis Area
*American peregrine falcon	Forages open habitats, nests on cliffs	Breeds and winters on both FS and BLM	Yes, addressed as Forest Service sensitive species.
Bendire's thrasher	Arid desert scrub	Does not occur on SJPLC	No
*Black swift	Cliffs at waterfallsf	Breeds on both FS and BLM	No, addressed as Forest Service sensitive species.
Black-throated gray warbler	Mature PJ woodlands	Breeds on both FS and BLM	Yes
*Burrowing owl	Prairie dog towns	Breeds on Dolores BLM, some habitat on Pagosa FS	No, addressed as Forest Service sensitive species.
Chestnut-collared longspur	Shortgrass prairie	Does not occur on SJPLC	No
*Ferruginous hawk	Grasslands, semi-desert with scattered juniper	May breed on BLM, not FS, winters on both	Yes, addressed as Forest Service sensitive species.
*Flammulated owl	Mature ponderosa pine, aspen, mixed conifer	Breeds on both FS and BLM	Yes, addressed as Forest Service sensitive species.
Golden eagle	Forages open habitats, nests on cliffs	Breeds and winters on both FS and BLM	Yes
Grace's warbler	Mature ponderosa pine with Gambel oak	Breeds on both FS and BLM	Yes

Gray vireo	Open juniper stands	Breeds on BLM, not on FS	Yes
**Gunnison sage-grouse	Sagebrush grasslands, permanent resident	Breeds on BLM, not on FS	No
*Lewis's woodpecker	Open pine forest, PJ woodland, riparian	Breeds and winters on both FS and BLM	Yes, addressed as Forest Service sensitive species.
Marbled godwit	Shorelines, mud flats	Does not occur on SJPLC	No
**Mountain plover	Arid grasslands	Does not occur on SJPLC	No
*Northern harrier	Grasslands, wet meadows	Breeds and winters on FS and BLM	No, addressed as Forest Service sensitive species.
Pinyon jay	PJ Woodland	Breeds and winters on both FS and BLM	Yes
Prairie falcon	Forages open habitats, nests on cliffs	Breeds and winters on both FS and BLM	No
Sage sparrow	Large stands of big sagebrush or greasewood	Breeds on BLM, not on FS	No
*Short-eared owl	Grasslands, wet meadows	Rare breeder on both FS and BLM	No, addressed as Forest Service sensitive species.
Snowy plover	Beaches, salt flats, playas	Does not occur on SJPLC	No
Solitary sandpiper	Shorelines, mud flats	Does not breed in Colorado, very rare migrant on SJPLC	No
Sprague's pipit	Tallgrass prairie	Does not occur on SJPLC	No

Swainson's hawk	Grasslands, desert, and agricultural.	Unlikely to breed on FS, breeds on BLM, migrant both	No
Virginia's warbler	Dense shrublands, primarily Gambel oak	Breeds on both FS and BLM	Yes
Williamson's sapsucker	Conifer habitats mixed with aspen	Breeds on both FS and BLM	Yes
Wilson's phalarope	Nest wet sedge & rush meadows with open water	May breed on BLM, not FS, uncommon migrant on both	No
**Yellow-billed cuckoo	Gallery cottonwood forest with dense understory	May have habitat on BLM, not FS, no recent records	No

*Forest Service sensitive species discussed in the Biological Evaluation (BE)

** Federal candidate for listing discussed in the Biological Assessment (BA)

FS – Forest Service

BLM – Bureau of Land Management

Environmental Consequences

The following paragraphs summarize potential project effects from alternatives 2, 3, and 4 to the 28 birds species identified as Birds of Conservation Concern by the USFWS. Potential human disturbance related impacts are expected to be greatest under alternative 4, followed by alternatives 2 and 3. Habitat related impacts (positive and negative) will likely occur more rapidly under alternative 4, followed by alternatives 3 and 2, given the time period treatment is expected to be completed in a given area.

The following 12 BCC do not have suitable habitat in the analysis area, therefore, the proposed action will have no impact on these species: Bendire's thrasher, chestnut-collared longspur, marbled godwit, mountain plover, prairie falcon, sage sparrow, short-eared owl, snowy plover, solitary sandpiper, Sprague's pipit, Swainson's hawk, and Wilson's phalarope.

The following 4 BCC are also classified as Forest Service sensitive species and do not have suitable habitat in the analysis area, therefore the proposed action will have no impact on these species: black swift, burrowing owl, northern harrier, and short-eared owl.

The following 3 BCC are also classified as federal candidates for listing under the Endangered Species Act (ESA) of 1973, as amended and do not have suitable habitat in the analysis area, therefore, the proposed action will have no impact on these species: Gunnison sage grouse, mountain plover, and yellow-billed cuckoo.

Four of the BCC are also classified as Forest Service sensitive species that have suitable habitat in the analysis area. Potential project impacts to the following species are disclosed in the BE: American peregrine falcon, ferruginous hawk, flammulated owl, and Lewis' woodpecker

There are approximately 91 acres of pinyon-juniper habitat in the analysis area. Proposed treatments will not affect pinyon-juniper habitat utilized by the black-throated gray warbler, gray vireo, and pinyon jay.

The project area provides approximately 4,050 acres (29% of analysis area) of shrub/Gambel oak habitat for Virginia's warbler. Treatment will occur across 34% (1,387 acres) of the suitable habitat. This species has similar habitat requirements and behaviors as the green-tailed towhee addressed in the MIS section. Potential project impacts to Virginia's warbler are expected to be similar to green-tailed towhee. Mitigation requiring retention of large diameter oak clumps during prescribed burning and mowing of shrub/Gambel oak stands will minimize potential affects to the species. The proposed action may have a low measurable effect on species abundance in the analysis area in the short-term (up 5 years post-treatment), and likely no measurable effect in abundance the long-term (greater than 5 years post-treatment). Prescribed burning will maintain structural diversity of Gambel oak in treated areas.

Golden eagles forage over open habitats such as grass-forb parks/openings, barren ground/rock, riparian, and sagebrush areas. These areas encompass 11% (1,528 acres) of the analysis area. Project activities will not affect these areas, and therefore will not directly impact golden eagles, or potential small mammal prey. There are no cliffs in the analysis area, and therefore no nesting habitat for eagles. Eagles may temporarily be displaced by vehicular use or increased human presence during active operations while flying through or foraging in the area. This potential disturbance will have little or no measurable effect on golden eagle use of the analysis area, or adjacent foraging habitat.

Suitable breeding and foraging habitat for Grace's warbler consists of ponderosa pine forests (Andrews and Righter 1992). Approximately 52% (7,227 acres) of the analysis area provides breeding habitat for the species. Treatment will occur across 78% (5,624 acres) of the suitable habitat. The species nests and forages in the upper canopy therefore, prescribed burning of the understory and thinning of primarily small diameter ponderosa pine in the lower and mid canopies will not appreciably affect habitat for the species. The proposed action will enhance ponderosa pine forest structure, improving habitat for Grace's warbler in the short and long-term via increased canopy closures by increasing crown size. The project is expected to have little or no measurable effect upon the species.

Williamson's sapsuckers are primary cavity nesters that breed primarily in ponderosa pine forests (Andrews and Righter 1992). These birds build their nests in aspen or conifers. The species depends upon short-lived, diseased, dying or dead trees scattered throughout the forest for foraging. This project will generally avoid trees important to this

species, the larger ponderosa pine and existing snags. The project is expected to have little or no measurable effect upon the species.

Transportation

Existing Road System

The Kenney Flats Analysis Area is located within a designated "B" travel area, which is an area that is closed to all motor vehicles, including ATV's and motorcycles, operating off of designated routes. Snowmobiles operating over snow are allowed. The existing Forest Service roads are shown on the alternative maps.

The five main open classified roads within the Kenney Flats Analysis Area, and the number of miles of these roads within the analysis area, are as follows:

Valle Seco Road – FSR 653 (approximately 2.5 miles)

Kenney Flats Road – FSR 006 (approximately 5.7 miles)

Big Branch Road – FSR 664 – (approximately 3.7 miles)

Archuleta Canyon Road – FSR 008 (approximately 1.9 miles)

Buckles Lake Road – FSR 663 (approximately 5.5 miles)

The Buckles Lake Road is graveled for its entire length. Portions of the Valle Seco Road and the Kenney Flats Road are graveled, however, the gravel appears only in short segments (1 mile or less). The Archuleta Canyon Road and the Big Branch road are not graveled. The portions of these roads that are not graveled are susceptible to damage if roads are used when wet, or when surface water is not directed off the road surface. These roads are usually impassable in the winter because of snow and/or gate closures.

The non-surfaced roads within the analysis area were constructed many years ago with little or no construction specifications. Refer to Figures 3 through 6, Alternative Maps, for the location of the classified roads. The Forest Service has designated a majority of the classified roads as closed roads. In addition to the classified roads, there are unclassified (non-system) roads in the analysis area. Since these unclassified roads are not officially part of the Forest Service transportation system, the public is prohibited from using most of them. However, it is documented that there is some illegal use of these roads by primarily ATV's during hunting season.

The following is a brief discussion of how the Forest Service describes roads under their jurisdiction. Forest Service roads have been defined by Forest Service Manuals, Amendment # 7700-2.

CLASSIFIED ROADS: Roads wholly or partially within or adjacent to National Forest System Lands that are determined to be necessary for long-term motor vehicle access, including state roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1).

TEMPORARY ROADS: Road authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the Forest transportation system and not necessary for long-term resource management (36 CFR 212.1).

UNCLASSIFIED ROADS: Roads that are not managed as part of the Forest transportation system, such as unplanned roads, abandoned travel ways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit for authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.2). Unclassified roads are not part of the official Forest Service transportation system.

OPEN AND CLOSED ROADS: Only classified roads can be designated by the Forest Service as open or closed. The open and closed designations refer to roads being open or closed to the public. A closed designation can mean that the road, although closed to the public, may be open to Forest Service personnel for administrative purposes such as fire suppression.

Many of the Forest Service Roads will need to be upgraded (recondition or reconstruction) to make them suitable and safe for material removal under Alternatives 3 and 4. The recreation section includes a discussion on the current use of Forest Service Roads.

A road analysis is being completed for this project. The road analysis includes an inventory of all classified and unclassified roads in a given area. The road analysis also includes estimates of open road densities and compares them to road density guidelines for each management prescription area affected. The road analysis is not a decision document, but does provide information relating to the potential effects of road use so that priorities can be identified and informed decisions can be made. With the exception of the 5B management prescription area, the open road densities meet the Forest Plan standards. The Kenney Flats Analysis Area includes four management areas. Management prescription areas are identified and described on Table 18*, Road Densities for Management Prescription Areas*.

Table 18: Road Densities for Management Areas

Management Area	Road Density Guideline (open miles/ square mile)	Existing Road Density (open miles/ square mile)	Management Emphasis
04B	0.5-1.0	0.4	Habitat for management indicator species
05B	0.0-0.5	1.0	Big game winter range
06B	1.0-3.0	1.4	Livestock grazing
07E	1.0-3.0	2.5	Wood fiber production and utilization

Source: USDA Forest Service, 1992

There are designated roadless areas within the analysis area. These areas are shown on *Figures 3 through 6, Alternative Maps*. There are 5.6 miles of open roads in the roadless area.

State and County Roads

No County roads will be involved in timber harvest activities. Average daily traffic counts (ADTs) have been acquired from the Colorado Department of Transportation (CDOT) for state highways. ADT is defined as the measure of traffic over a 24-hour period and is determined by counting the number of vehicles passing a particular point in either direction. ADT's on Highway 84 range from 3200 at Pagosa Springs to 784 at the New Mexico state line. See *Table 28, State Highway ADT.*

Table 19: State Highways ADT

Highway 160 – Pagosa Springs City Limits	**ADT**
East	3,853
West	8,503
Highway 84 – Intersection at Highway 160	
North	1,778
South	3,200
New Mexico State Line (South)	784

Source: CDOT, Southwest Office, ADT counts 2002.

Transportation Environmental Consequences

The "open" or "closed" status of the roads would not be changed under any alternative. Given that there will be no new permanent roads and no change in open road miles, the open road density will not change over the long term as a result of any of the action alternatives.

No material removal is planned in the roadless areas. However existing roads will be used as access for mowing operations and prescribed burns.

No Action

There would be no changes to the current Forest Road transportation system under the No Action Alternative. There would be no improvements to the roads or the drainage systems of the roads, other than regularly scheduled maintenance.

Alternative 2

There would be no changes to the current Forest Road transportation system under Alternative 2. Under Alternative 2, there would be increased use of the Forest roads to access the mowing, thining and prescribed burn areas. However, only minor impacts to the roads are expected and some roads may be upgraded on an as-needed basis which would be a positive impact.

Alternative 3 and Alternative 4

Forest Roads

Forest Service roads would be used to access the mowing and prescribed burn areas and as haul routes to access the state highway for transport to mill sites. Although there would be no changes to the current Forest Road transportation system, many of the roads in the analysis area that are currently closed will be utilized for the logging operation.

Road reconditioning or reconstruction would be required on many of the existing Forest Service roads that will be used in the timber harvest operation. On most roads, reconditioning would consist of light dozer work followed by grading. However, some roads would require moderate reconstruction work to remove slide material, repair eroded areas and ditches, adjust road alignment and harden road crossing low points in the drainages and boggy areas. Multiple tracks through wet areas will be rehabilitated. The impacts associated with reconditioning and reconstruction are expected to be short-term and minor. Existing impacts associated with poor drainage will likely be reduced since drainage structures will be repaired.

All new roads planned would be designated as temporary roads. These roads would be constructed to Forest Service specifications. All roads, classified and temporary, would be inspected prior to commencement of project activities to repair drainage features such as water bars, drainage dips, culverts and ditches. All temporary roads would be rehabilitated after project completion.

Merchantable timber would be removed from Forest Service lands using log trucks. Log trucks would haul approximately 5,000 board feet per load. A majority of the loads would move over FSR 006, and FSR 008. The logs would be taken to milling sites located in various directions and distances from the project area. In Alternative 3, the activity would take place over about a 20 year period while in Alternative 4, the activity would occur in 5 years. In both Alternatives, periodic maintenance of the roads (primarily grading) will be required. Impacts are expected to be minor.

All reconditioning, reconstruction, and temporary road construction will conform to Forest Service specifications; therefore adverse impact from these activities is expected to be minor. Road drainage conditions will be evaluated and upgraded, as needed, for all roads used in restoration activities. This will include the construction of water bars, swales, borrow ditches, hardening road crossings through wet areas, and the repair or installation of culverts. The purpose of these activities is to avoid concentrating runoff.

Therefore, there will be a positive impact in terms of drainage and erosion control for the Forest road system.

Most of the current "open" classified roads will remain open during fuel reduction operations. Some short segments may be closed temporarily due to safety concerns. Warning signs alerting the public to truck traffic will be posted at strategic locations.

State Roads

Impacts on state roads will be minor. Referring to the ADT's supplied by the State of Colorado, traffic numbers generally range in the thousands. In addition, large trucks are common on the state highways. (Refer to Table 28 State Highway ADT's)

Private Roads

In order to access some of the treatment areas, private roads will need to be used. Approvals and agreements with the local land owners will need to be obtained prior to using these roads.

Maintenance Costs

Contractors pay a user fee to use state and county roads. In addition, the trucks must meet specific weight requirements. The fees are intended to pay for the damage caused by the frequent use of roads by high gross vehicle weight vehicles. The Forest Service roads will require periodic road maintenance work due to the log truck traffic. Additionally, the Forest Service will collect surface rock replacement deposits on all Forest Service roads that are surfaced with gravel.

Recreation

Affected Environment

The Kenney Flats Analysis Area has low to medium recreational use in the summer and medium to high in the fall. In the analysis area, big-game hunting is the dominant recreation activity, occurring in the fall. Summer dispersed recreation includes hiking, fire wood gathering, driving for pleasure, and some mountain biking. In the fall hunters use ATV's during hunting season. Otherwise ATV use is not significant in the area. Minor levels of cross-country skiing and snowmobiling occur throughout the motorized area in the winter, particularly on the Buckles Lake Rd (FSR 663).

No developed trails exist in the analysis area. The closest developed trail is the V Rock Trail that is just outside the eastern boundary of the analysis area. The trail provides access to the South San Juan Wilderness Area.

No developed campgrounds are located within the analysis area. Approximately 25 dispersed campsites are used for dispersed camping and recreational activity, particularly in the fall during hunting season. Most of these sites are fully occupied during hunting season. The Blanco River Campground is the only developed campground in the vicinity of analysis area. It is located just north of the analysis area on the Blanco River.

The analysis area is in close proximity to the South San Juan Wilderness Area, which is located east of the analysis area boundary.

Estimates of Recreation Visitor Days within the analysis area are shown in Table 20.

Table 20: 2002 Estimated Recreation Visitor Days

Visitor Category	RVD
Hunters	2500
Wood Gathering	750
Sightseeing /Pleasure Driving	500
Snowmobiling	550

Source: Ron Decker, Recreation Specialist, Pagosa District, SJNF

Six or seven years ago, the Forest was broken into recreation compartments. A capacity study was done on each compartment to determine the number of user days available per compartment. This study was done to determine if there was any use available for new outfitter guide permits or additional use for existing outfitters.

The Kenney Flats Analysis Area is within parts of 2 recreation compartments, the Mesa compartment (with a user capacity of 15,271 in summer, and 5,024 user days in the fall) and the Navajo compartment (Summer capacity 5,559, and fall, 1,829). The estimated yearly use in the Mesa compartment is 42% of total capacity in summer (6,666 user days in summer) and 62% in fall (3,103 user days in the fall). The estimated yearly use in the Navajo compartment is 45% of total capacity in summer (2,500 user days in summer) and 63% in fall (1,163 user days in the fall). The largest number of acres is within the Mesa compartment. There are 8 outfitters/guides with permitted use in either the Mesa or Navajo compartments, however not all of the use is within the Kenney Flats Analysis Area. The Outfitter activities are: hunting, trail rides, bike tours and fishing. Most of the outfitter use within the analysis area is the fall hunting use and is primarily day use.

The Kenney Flats area is located in Game Management Unit (GMU) 78. Although the analysis area has heavy hunting use during the hunting season it is only a small portion of the overall GMU. The table below shows total annual hunters and deer and elk harvest in GMU 78 from 1999 through 2001.

Table 21: Hunting Statistics, All Seasons: 1999 - 2001 Game Management Unit 78

	1999	**2000**	**2001**
Deer Harvest	472	370	326
Elk Harvest	643	1557	639
Total Harvest	1,115	1,927	965
Deer Hunters	1,209	1,113	894
Elk Hunters	6,067	6,220	3820
Total Hunters	7,276	7,333	4,640

Source: Colorado Division of Wildlife

The Alpine Lakes subdivision is located within the Kenney Flats Analysis Area. Residents of this development use the area during the summer months for hiking, biking, and horseback riding. Off-road use is closed to motorized vehicles.

The Kenney Flats Road (FSR 006) is a popular loop road for 4WD and ATVs, particularly during hunting season. Some illegal ATV use occurs primarily during the big game hunting season. Other 4WD roads within the analysis area include the Big Branch Road (FSR 664) and the Valle Seco Road (FSR 653).

Winter recreation use, primarily snowmobiling and a very small amount of cross-country skiing, is considerably less than summer/fall use. The local snowmobile club, Wolf Creek Trailblazers, does not typically operate in this area, however FSR's 664 and 663 are listed as snowmobile routes in handouts. No groomed snowmobile trails or snowmobile tours occur in the Kenney Flats project area.

The Forest Service uses the Recreation Opportunity Spectrum (ROS) system to inventory, analyze, and manage National Forest recreation settings. The system categorizes National Forest System lands in classes, each class being defined by its setting and the probable recreation experience and activities it can provide. The Kenney Flats Analysis Area includes ROS settings of Roaded Natural (RN) and Semi Primitive Non- Motorized (SPNM). These classes are defined below:

Roaded Natural (RN) Characteristics of this classification include a natural appearing environment within roaded areas, prevalent evidence of other users, and evidence of past resource management activities. RN areas are predominately natural appearing but are readily accessible to vehicles.

Semi-Primitive Non-Motorized (SPNM) This area is characterized by an environment that appears predominately natural. Evidence of other users is present, but there is little interaction. Motorized use is not permitted. SPNM areas differ from primitive only by the degree in the type of recreational experience users enjoy. The probability of experiencing isolation, independence, closeness to nature, tranquility, and self-reliance in an environment of challenge and risk is high although not as high as in a Primitive area.

Recreation Environmental Consequences

No Action

Under the No Action Alternative, there would be no recreation-related impacts other than those related to the ongoing planned program of prescribed burning.

All Action Alternatives

Impacts common to all action alternatives would include a less dense forest that would result from the improvement cuts. Cover for wildlife would be reduced, but forage and viewing distances for hunters would increase. This may increase hunting success in the Kenney Flats area. No changes to ROS designations would occur under any of the action alternatives.

Alternative 2

Alternative 2 would have the greatest impact on recreationists in the area, since the timber would be left on the ground until prescribed burning occurs. Although treatment would be targeted in 25 % increments for each of the four 5 year periods, the volume of

improvement cuts would be substantial and be noticeable to recreators during the first 5 year period. Fuels on the ground would impede travel for hunters on foot and other recreators (hikers) in the cutting areas through each of the four 5 year periods until prescribed burning occurs.

Alternatives 3 and 4

Under Alternatives 3 and 4, if sale activities occur during the fall, there would be some displacement of hunters during the big-game season. This impact should be minimal, since there are ample areas adjacent to the project area to accommodate displaced hunters.

During the life of the project, summer/fall recreation visitors traveling the internal road system (including Kenney Flats Road – FSR 006) would encounter log truck traffic (see Consequences, Transportation).

Winter plowing may occur for this project. Impacts to winter users is expected to be minimal given the low winter use. In addition, the area can be accessed without using roads.

Land Use

The Kenney Flats project area consists of 15,650 acres of which 1,643 acres is private. General Land Management prescriptions within the analysis area are listed below.

6B - Emphasizes livestock grazing through use of intensive grazing management systems and investments in structural and non-structural range improvements. Conflicts between livestock and wildlife are resolved in favor of livestock. Forest lands in portions of the area are suitable for timber production

4B - Emphasizes wildlife habitat management for one or more indicator species. Roaded natural recreation opportunities will be provided, but vegetation treatment and human activities are managed to provide optimum habitat for the selected species. Forest lands in portions of the area are suitable for timber production.

5B – Emphasizes forage and cover on wildlife winter ranges. Livestock grazing is compatible but is managed to favor wildlife habitat. Forested lands in portions of the area are suitable for timber production.

7E - Emphasizes production and utilization of wood fiber for saw-timber on gentle slopes. Management activities are not evident or remain visually subordinate along primary roads and trails. Dispersed recreation opportunities are available.

Current uses include recreational opportunities as described in the Recreation section and livestock grazing, and residential uses. Most uses are concentrated on or along existing roads, and hence, impacts are also concentrated along roads. Roads include both classified (system) and unclassified (non-system).

The Alpine Lakes Development has 9 subdivisions to date (the first platted in 1994). The residential development area lies within and borders the southwest corner of the project area and encompasses approximately 1,600 acres within the analysis area. Spence Reservoir is within the subdivision. The development is in Archuleta County, has 208 platted lots ranging in size from 35 to 105 acres. As of February 2003, there were 52 lots with improvements. Several miles of new roads, associated with the development are planned or have been constructed.

There are two other private in-holdings within the area, each being 120 acres, both of which have the potential to be sub-divided. Along the northwest corner of the analysis area are numerous older developments and lots in the Lower Blanco and Rio Blanco areas.

Land Use Environmental Consequences

An estimated 3,826 acres are anticipated to be treated for all action alternatives. Land management prescriptions would not be altered from their current prescription. All alternatives would affect recreational activities to some degree in treatment areas during treatment activities. These impacts are not considered significant.

Potential impacts on Alpine Lakes residents may include noise from project activities (i.e. chain felling, skidding, log loading, and truck hauling). Since the sub-division lies on topography facing away from the project area and there are forested areas between the private land and the project area, much of the noise may be lessened or dissipate before reaching residents. A transportation impact on Alpine Lakes and other local residents, over the project period, will be increased log truck traffic on Highway 84 (*see Transportation Section*). Alpine Lakes resident may also be impacted temporarily from smoke produced by prescribed burns.

Other land uses in the area will not be altered although Alternative 2 will impact hunters and other recreators due to the abundance of cut material on the ground after treatment. This downed material would impede any foot traffic in the forest.

No Roadless areas would be impacted other than for mechanized mowing that would occur along private property boundaries and prescribed burning.

Existing roads will be reconditioned and reconstructed for Alternatives 3 and 4. Temporary roads will be built for product removal activities. (see *Transportation Section*)

Visual Resources

Importance Of The Scenic Resource

From a Forest wide perspective, Kenney Flats is not an important recreational area. The majority of the analysis area receives low visitation except during hunting season, and there are no unique or significant features that attract users or viewers.

Landscape Character And Variety Class

The Kenney Flats Analysis Area is between the upper Blanco River drainage on the north and Mesa Cortado and Hwy 84 on the south. Buckles Lake Rd. (FSR 663) is the east boundary with no definable boundary on the west. The analysis area is typified by moderately dissected rolling terrain generally with the flats in a Southern aspect. The vegetation is stands of even-aged ponderosa pine, mixed conifer, some aspen, Gambel oak and meadows at an elevation ranging from 7,000 to 8,700 feet. The aspen east of the analysis area adds a dramatic color display in the fall that can be viewed mainly by travelers along U. S. Highway 84.

The terrain is relatively gentle with slopes predominately less than 25%. Spence Reservoir is the only significant water feature. Intermittent streams within the analysis area include Spiler Canyon, Coyote Creek and Boone Creek. A few parks of varied sizes are scattered throughout the area and a few scattered rock outcroppings.

Regarding scenic quality, classifying an area into different degrees of visual variety determines those landscapes that are most important and those of lesser value to the viewer. A backdrop such as provided by the high peaks of the San Juan in contrast to the associated viewsheds of the analysis area. The landscape or scenery of the analysis area is typical of this elevation zone on the Pagosa Ranger District, and, as such, is classified ``Class B - Common.''

Sensitivity Level

"Sensitivity Level" is a measure of public concern for the scenic quality of National Forest land, and is determined by the amount and kind of human use. Recreational use of the Kenney Flats area consists primarily of hunting during the fall, pleasure driving, and dispersed camping and wood gathering during the summer. The area has active range (cattle) permits during the summer months.

The area is viewed from one major and three secondary viewing corridors: U.S. Highway 84, through Halfway Canyon; Kenney Flats Road (FSR 006) in the interior of the analysis area; Buckles Lake Road (FSR 663) on the eastern boundary of the project area, and Valle Seco Road (FSR 653) in the western segment of the analysis area. The major viewshed (total visible area from single- or multiple-viewer positions) is Highway 84 between Pagosa Springs and the New Mexico border. Portions of the analysis area may be viewed by travelers on Highway 84, particularly near Halfway Canyon and the mid-section of the analysis area adjacent to the highway, although the majority is obscured by terrain along the highway corridor.

The viewing areas along Highway 84 include areas of foreground (1/3 mile) and middle ground (1/3 mile to 4 miles), by both southbound and northbound traffic. Travelers along FSR 006, FSR 663 and FSR 653 see the area as foreground and middle ground. There is no background viewing area within the analysis area

All roads and trails were inventoried and rated by a District Sensitivity Level Task Force in 1992. These ratings for the area are shown in the following table.

Table 22: Relative Sensitivity of Roads

State Hwy 84	High Sensitivity or Level 1
FSR 663	High Sensitivity or Level 1 (access to South San Juan Wilderness)
FSR 006	Medium Sensitivity or Level 2
FSR 653	Medium Sensitivity or Level 2
FSR 664	Medium Sensitivity or Level 2
FSR 008	Medium Sensitivity or Level 2

There are a number of other interior roads in the area. The majority of these roads are closed and receive limited use by the public, except during hunting season.

Visual Quality Objective (VQO)

The above inventories or Variety Class and Sensitivity Levels are combined to produce the Visual Quality Objectives of the analysis area. They are Retention, Partial Retention, and Modification. The Retention VQO requires all management activities be non-evident to the casual observer. Partial Retention allows that activities can be evident to the observer but should repeat form line color and texture common to the characteristic landscape. Modification allows an activity to be both evident and dominate but suggests

that visual results of an activity compliment naturally the form, line, texture, and color of the characteristic landscape.

There is a band of Retention on either side (foreground viewing area) of Highway 84 and the Buckles Lake Road. The other forest roads have a Partial Retention buffer around then for the foreground viewing area. The rest of the area is typified as Modification.

Environmental Consequences

The major portion of the area is viewed as middle ground from the internal roads, and has a VQO of Partial Retention. Partial Retention provides for management activities that remain visually subordinate to the characteristic landscape. Activities may be evident, but should not draw attention to their existence. Other unseen areas would receive a Modification VQO classification, which allows for activities to visually dominate the characteristic landscape.

The area has a Visual Quality Objective (VQO) of Retention for foreground areas seen along open roads. Retention requires that all management activities not be visually evident to the casual observer. Although this does not preclude such activities, it does necessitate that they be situated and designed in such a way that they appear as natural occurrences in the characteristic landscape. The patterns in the landscape resulting from the removal of mature trees, individually or in groups, should repeat natural forms found in the characteristic landscape so they are not discernible. By not cutting pre-settlement trees, this should be achieved. Initially prescribed fire will result in blackened tree stems of varying height. These blackened areas dull and weather over time.

The few areas that may be seen as middle ground from the major travel routes would be classified as Partial Retention. The VQO for unseen areas would be Modification. Partial Retention requires that activities not be readily apparent and appear natural, whereas under Modification, management activities are dominant but appear natural.

No Action

This alternative would perpetuate the existing vegetation character of the area in the near future. There would be no negative impacts in the short term and only natural alteration (barring destructive wildfire) of the landscape in the long term. A continued imbalance in stocking characteristics, i.e**.** a continuation of even-aged timber with few older ponderosa pine, an abundance of smaller Gamble oak, but few larger oaks. Prescribed burning would blacken tree stems but weather over time.

Alternative 2

Alternative 2 would thin dense ponderosa pine throughout the analysis area, leaving the material on the ground and then burn. No commercial product removal would occur. The downed timber and slash left after cutting would impact the foreground and middle ground viewing and would change the VQO to Modification in all areas affected by treatment until prescribed burning is completed.

State Highway 84 and FSR 663, both Level 1, High Sensitivity roadways would be impacted by the proposed treatments since thinning would occur within the foreground and material would be left along the roadway and would be fully visible to the observer driving these roads. Depending on treatment along these corridors, the existing VQO of Retention would change to either Partial Retention or Modification. The units affecting

these travel corridors include 1,4,5,10,13,14, 25,27,28 and 29. Prescribed burning would also occur within these units. These impacts would be long term since the thinned material would be left in the forest. As new growth regenerated, the Retention VQO would be met in the long term, but short term visual impacts would be evident for many years.

These units would look considerably more open after treatment. Creating more openness is generally a visual or scenic preference of the public, because of increased opportunities to view the roadside landscape. These units would meet the Partial Retention VQO as understory vegetation and ponderosa pine regeneration become established 3-5 years after harvest.

Depending upon how treatment is designed, the remaining units (2,3,6,7,8,9,11,12,15, 16,17,18,19,20,21,22,23,24,and 26) would retain the existing VQO of Partial Retention or Modification, although the visual effects of downed timber would have negative aesthetic impacts to the observer.

Other units and group-selection areas would also be visually affected in the middle ground and background viewing zones due to the amount of timber left on the ground. There may be a short-term visual impact in those sites that receive prescribed burning, for anyone who may walk through these treatment areas.

Alternative 3

The impacts to visuals under Alternative 3 would be similar to those described in Alternative 2, however,much ofthe treated material would be removed rather than left on the ground. Material would be thinned incrementally every 5 years in four different areas, over a period of 20 years. Therefore the visual impacts would occur at different periods of time in one area, as compared to Alternative 2. This alternative would not have as dramatic visual impacts as those described under Alternative 2. The magnitude of the visual impact would be less throughout the area because much of the thinned material would be removed rather than left on the ground.

Alternative 4

The volume of improvement cuts for Alternative 4 would be similar to Alternatives 2 and 3, but would occur in one five year period. The visual impacts would be similar to those described for Alternative 3, but all the larger material would be removed within 5 years over the entire area instead of 20 years. The units would look considerably more open after treatment. Creating more openness is generally a visual or scenic preference of the public, because of increased opportunities to view the roadside landscape. The units would meet the Partial Retention VQO as understory vegetation and ponderosa pine regeneration become established 3-5 years after harvest. A less dense forest and more diverse forest would result.

Socio-Economics

Temporal And Spatial Scope of Analysis

This financial efficiency analysis covers a 10 year period of costs and revenues. Beyond a decade, the value of discounted costs and revenues becomes small and future outputs somewhat speculative in nature.

FOREST PLAN DIRECTION

Provide timber sale offerings that address the needs of local dependent industry (Forest Plan, page IIIa-1).

Provide the opportunity for economic growth of industries and communities dependent upon Forest outputs (Forest Plan, III-5).

Provide the opportunity for community stability and cohesion within the Human Resource Units.

DESIRED CONDITIONS

The Forest Plan does not describe a desired condition for the local social or economic environment. The interpreted desired condition for local economic conditions is to provide existing local community employment and income opportunities by providing access to forest resources. An interpreted desired condition for the local social environment is a professional and sustainable relationship between local communities, the Forest, and its resources.

Affected Environment

The Kenney Flats Analysis Area lies entirely within Archuleta County and within easy access of Pagosa Springs; these areas are the focus of the social and economic analysis. Some residents of the County depend upon a variety of forest resource-related activities and access to resources for their economic livelihood. These forest resource-related activities include; wood products, hunting and outfitter guiding, ranching, and tourism resort-based activities. Some residents in the area surrounding the project area consider the forest resources and forest health as an important part of their quality of life. Visitors, both local and non-local, use the area for a wide range of recreation activities including; hunting, firewood gathering, pleasure driving, 4 wheel driving, dispersed camping, wildlife viewing and snowmobiling**.**

Demographics

Table 32 highlights the population and average annual growth of Colorado, Archuleta County and Pagosa Springs. Archuleta County has grown at a faster rate than Colorado in the 1990's and in 2000, but the State Demographers Office predicts growth will slow in the future, but still remain faster than the overall State growth rate. Pagosa Springs growth between 1990 and 2000 is similar to the State; estimates of future growth are not available for comparison.

The counties surrounding the San Juan National Forest continue to be attractive places for people to live. Changes in flexible work place, transportation, and communications have allowed people to continue working for city-based companies while living in rural or mountain communities. Archuleta County is currently less than one percent of the total state population and has a significantly higher median age at 40.8 than Colorado's at 34.8. The population of Pagosa Springs makes up about 16 percent of the County and has a slightly younger median age at 37.1.

Table 23: Population Growth of Colorado, Archuleta County and Pagosa Springs

	1990	1995	2000	2005	2010	2015
Colorado Population	3,304,041	3,811,074	4,301,261	4,733,167	5,170,938	5,617,933
Average annual growth rate (%)	Na	3.1	2.6	2.0	1.8	1.7
Archuleta population	5,345	7,108	9,898	12,441	14,922	17,394
Average annual growth rate (%)	Na	6.6	7.9	5.1	4.0	3.3
Pagosa Springs population	1,207	1,362	1,591	na	na	na
Average annual growth rate (%)	Na	2.6	3.4	na	na	na

Source: Colorado State Demographers Office, 2001.

The Census Bureau is a key source of information for social and economic analyses. The 2000 Census has recently been completed, but not all information is available for all places. One statistic that has been released that highlights changes in Archuleta County and Pagosa Springs is the percent of homes that are occupied for seasonal, recreational, or occasional use. The table below compares housing occupancy between 1990 and 2000 for Colorado, Archuleta County, and Pagosa Springs.

Table 24: Home Occupancy; CO, Archuleta County, Pagosa Springs, 1990 - 2000

Unit Type	Colorado		Archuleta County		Pagosa Springs	
	1990	2000	1990	2000	1990	2000
	- - - - - - - percent of total housing units - - - - - -					
Occupied housing units	86.8	91.7	50.9	64.1	83.1	84.9
Vacant housing units	13.2	8.3	49.1	35.9	16.9	15.1
For seasonal, recreational, or occasional use	4.3	4.0	29.2	23.4	3.3	6.0

Source: U.S. Census Bureau, 2001.

Seasonal homes are a small percent of the total housing units in Colorado, but in Archuleta County these homes make up 23 percent of total housing units. The percentage has declined about 6 percent in the last 10 years, but in Pagosa Springs the

percentage of seasonal homes has almost doubled. This level of second homes, or absentee homeowners can have a significant impact on the local economy and community. In some cases, second homes provide a variety of service job opportunities within the community. But these homes also tend to be remote, built on former agricultural lands, which can serve as a type of community open space, and can often cost the local government more in services than they receive in taxes.

Employment and Income

Table 25highlights the number of jobs from 1998 to 2001 for each industry, the percent of total employment for each sector, and earnings by sector for 2001. These employment numbers are not full time equivalents, but are a count of all wage and salary jobs covered by unemployment insurance in Colorado. They do not account for sole proprietors, which can often be substantial. The growth in the county can be seen in the high percent of jobs within the construction sector. Tourism's role in the county is highlighted in the services and trade sectors, both of which are a large percentage of total employment. The percentages in other sectors highlights the lack of diversity within the county, but as growth continues, it is likely the diversity will increase. The county is lacking a strong manufacturing or transportation base which may cause the county to be pulled and pushed with outside trends in tourism, second home ownership, and other services oriented activities.

Table 25: Estimated Covered Employment by Sector and Earnings by Industry (2000) - 1998-2001 –Archuleta County

Economic Sector	1999	2000	2001	% of total	2001 (in millions of $)	% of total
Agriculture	58	58	44	1.4	1,269	1.7
Mining	31	25	29	<1.0	830	1.1
Construction	368	389	413	12.8	11,097	15.3
Manufacturing	60	95	35	1.1	1,182	1.6
Transportation, Comm, Utilities	73	76	84	2.6	5,757	7.9
Wholesale and Retail Trade[1]	930	947	607	18.8	12,482	17.2
Services[1]	638	664	1,122	34.8	17,435	24.0
Finance, Insurance R.E.	279	280	269	8.4	8,596	11.8
Government	517	551	588	18.3	14,679	20.2
Total Employment All Sectors	2,954	3,085	3,221		72,479	
Total Employment Private Sector	2,437	2,534	2,633		57,800	

1 Changes in trade and services sector from 1999/2000 to 2001 was a transfer of eating and drinking establishments from retail trade in previous years to services in 2001. Source: Colorado. Demography Section, CO Dept. of Local Affairs)

Notes: Totals may not add up because of disclosure restrictions and farm income losses to proprietors, which are not shown on the table. Income information is more difficult to collect than employment due to state disclosure laws.

Forest Resource-Related Industries

The San Juan National Forest provides resource opportunities for several resource-related industries: wood products, mining, recreation and tourism, and grazing. There are no mining activities that would be affected by any of the alternatives for this project. There is currently an active grazing allotment with the analysis area.

The Pagosa Ranger District has active timber sales under contract with mills as far away as Montrose, Colorado. The Colorado State Forest Service, Durango District, completed a survey of Forestry Contractors in October of 2002. At this time, Archuleta County had three sawmills. The sawmill capacity in Archuleta County is less than a million board feet. The South Fork sawmill, located in Rio Grande County, closed and sold off all infrastructure, further decreasing surrounding sawmill capacity. The closest sawmills that may be interested in the material offered from the Kenney Flats project are Western Excelsior Intermountain mill, Stoner Top, and Loblolly. Project contractors from within Archuleta County may be employed for the sale, but a majority of wood production activity from the proposed fuels reduction and ponderosa pine restoration project would likely be exported to surrounding counties for processing. Throughout the area around the San Juan National Forest, there are several small operations producing house logs. As of 1999, 26 businesses were involved in forest products manufacturing and related contracting businesses. Contractors represented the largest segment of forest products businesses at 58 percent.

Table 26: Local Mill Capacity and Current Purchase Price (December 2002)

Mill	Location	Annual Capacity	Mill species	Purchase Price	Notes
Western Excelsior	Mancos, CO	50 MMBF	Will take anything	$34/ton delivered	Mill can peel, dry, and shave
Stoner Top (Ragland & Sons)	Dolores, CO		Engelman Spruce, Ponderosa Pine, Douglas-fir	$200 delivered	Interest will be dependent on what he has in yard at bid time
Intermountain Resources	Montrose, CO	36 MMBF, can double capacity with second shift	Engelman Spruce, Ponderosa Pine, Douglas-fir, True Firs (less than 20% of load)	$250 –280/MBF burned timber delivered, $320-350/MBF green timber delivered	Very interested. 2 crews available, pays more than other mills, high quality mill; can dry and plane. Sells finished products out of state.
Loblolly	Arboles, CO	NA	Conifer	NA	

Notes: Table based on personal conversations with mill representatives.
Purchase Price is not Stumpage Value. Delivered purchase price includes stumpage value+logging+transportation cost

The wood products industry, although small in comparison to the tourist industry, is an important industry in Archuleta County. It provides diversity to the economic base and employs approximately 100 people.

Income associated with logging activity is difficult to estimate. In May of 2002, a survey was conducted in Region 2 by the Forest Service (Petaisto) to determine logging labor rates. In Colorado, wage rates ranged from $11.00 per hour for clerical staff to approximately $28.00 for a faller. Large equipment operators make anywhere from $22 to $27 per hour. The average range for a mill worker is $10.30. Overall, wages related to the logging industry are fairly high.

Environmental Consequences

The following analysis highlights both social and economic issues and potential impacts. In some cases, qualitative assessment has been used where quantitative values were not identifiable or available.

Financial Efficiency

Financial Efficiency is a comparison of those costs and benefits that can be quantified in terms of actual dollars spent or received on the project. The main criterion in assessing the financial efficiency of each alternative is Present Net Value (PNV), which is defined as the discounted value (at 4 percent) of agency revenue minus agency costs. When considering quantitative issues, financial efficiency analysis offers a consistent measure in dollars for comparison of alternatives. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values, benefits, and costs that are not easily quantifiable. This is not to imply that such values are not significant or important - but recognizes that non-market values are difficult to represent with appropriate dollar figures. The values not included in this part of the analysis are often at the center of disagreements interest people have in forest resource projects. Therefore, financial efficiency should not be viewed as a complete answer but as one tool the decision maker uses to gain information about resources, alternatives, and trade-offs between costs and benefits.

Present Net Value is an economic measure that accounts for all current and future costs and benefits within the treated units in a single dollar figure. Future costs and benefits are estimated and discounted into today's dollars and added to the current project costs and benefits. The result is a figure that can be compared across alternatives representing the total financial impact over the life of the project. Because a dollar is worth more now than it would be in the future, discounted costs and benefits are smaller figures. For example, a benefit of $1,000,000 in 100 years is worth about $20,000 today using the standard government discount rate of four percent.

Table 27*, Present Net Value by Alternative* displays the financial efficiency analysis for quantifiable costs and benefits that change by alternative. The table highlights the PNV analysis for the Kenney Flats restoration and fules redcution project. This analysis is in compliance with FSM 1970.3, 1970.6 and the Region 2 Supplement. The analysis considered all costs and revenues, with timber revenues based on regional timber sale appraisal bulletin No. BU2123. Forest Service implementation costs included sale preparation, sale administration, service contract, mechanical mowing, understory thinning/slashing, prescribed burn, handpiling, noxious weed surveys, temporary roads,

road reconstruction and reconditioning costs. The No Action Alternative represents the baseline from which to compare the action alternatives and is valued at zero.

Table 27: Present Net Value by Alternative. (thousands of $)

	Discounted Total Costs	Discounted Total Benefits	Discounted Present Net Value	Benefit/Cost Ratio
Alternative 1	0	0	0	0
Alternative 2	-$3,275	$23	-$3,252	.01
Alternative 3	-$2,712	$1,163	-$1,549	.43
Alternative 4	-$3,389	$1,331	-$2,058	.39

Source: Quicksilver, 2000.

All action alternatives show a net loss through the analysis period. The costs involved in calculating net present value include significant costs for fuels reduction and forest restoration. These additional costs include prescribed burns, thinning, handpiling, mechanical mowing and other treatment of materials on site. Alternative 3 shows the lowest net loss of the three action alternatives analyzed. The figures in Alternatives 2 and 3 reflect the discounted costs over the 20-year period and the discounted revenues generated from the improvement cuts or sale of firewood and poles. For Alternative 4 the analysis period is 5 years, so costs and benefits are discounted out to year 5.

The benefit/cost ratio equals the sum of the discounted benefits divided by the sum of the discounted costs. The project can be accepted as economically feasible as long as the ratio is equal to 1 or greater. The ratio can be used to note how much costs need to decline in order to make a project economically attractive. The benefit/cost ratio for Alternative 3 is 0.43, which suggests that costs would have to decline by 57 % to make the project economically viable. Alternative 2 is the worst case (0.01), considering no timber is sold commercially and the only revenues generated are from private sales of poles and firewood. Alternative 4 has a slightly lower benefit/cost ratio than Alternative 3 since cost are not discounted through the full 20-year period.

The loss reflected in this analysis is largely due to (1) meeting noncommercial timber sale objectives, (2) the cost of restoration treatments that would not normally occur in a commercial sale, (3) some lower-value, small diameter product being removed to meet project objectives, and (4) depressed market conditions.

Economic Efficiency

Non-market benefit values prepared at the Washington Office by the RPA staff are used when the appropriate outputs vary between alternatives. The economic analysis for this project is identical to the financial analysis because no change in those outputs for which the FS has established values (range, recreation, and water) was quantitatively estimated.

Social And Economic Impacts

Non-quantifiable positive impacts would come from the reduction of fire risks associated with the fuel treatment and restoration project for all alternatives. Residents in the area

will feel a sense of security in knowing that the wildfire hazards in the area have been reduced.

Alternative 2 would have no social or economic impact on the local region other than some increase in employment during the service contract period.

Alternatives 3 and 4 would have no impact on long-term population or housing in the area. Short term demand for temporary housing may occur in Pagosa Springs during improvement cut activities associated with Alternatives 3 and 4. Also local purchases for goods and services in the local economy from non-local loggers would occur as well, if a non-local contractor purchases the timber sale. Direct employment and income impacts are described under Timber Industry

Timber Industry

Alternative 2 would not impact the timber industry. For Alternatives 3 and 4, there would be minor direct impact within Archuleta County from the commercial sale due to a lack of wood products industry and infrastructure. The Colorado State Forest Service conducted a survey in 1999. In the survey 26 businesses were identified that related to raw material acquisition and forest product manufacturing in Archuleta County. Four of the 26 characterized their businesses as that of conventional sawmilling or primary manufacturing. Contractor services represented the largest segment of the Archuleta county forest products manufacturing community. Few of the businesses operated full time. In 2000, the Colorado Dept of Labor Market information showed a total full time employment in the wood products industry of 7 in Archuleta County.

Under current conditions, it is likely that a larger mill from outside the county will purchase the merchantable material for Alternatives 3 and 4. For Alternative 4 the volume of material produced in such a short time may be greater than the regional mills could absorb, depending upon what other contracts may be available at the time of the sale. Impacts to Pagosa Springs would likely be small. If local loggers or an Archuleta County mill were to bid on the sales, there would likely be a greater level of local indirect positive impact in the form of local spending on goods and services, as well as the direct impacts from loggers and mill operators.

Local residents of the area may not feel major direct economic impacts of the sales unless a local company and mill purchase the timber contract, however, there may be non-quantifiable benefits gained, such as improvements in the existing road system accessing the project area, and improvements in general forest health within the project area.

Depending upon stumpage values, most of the local mills and contractors would be interested in bidding on the Kenney Flats improvement cuts. Table 26, Local Mill Capacity and Current Purchase Price shows the local mill capacities and what they are currently paying for delivered timber to the mill. Because of the proximity of the restoration area, the economic return on this timber would be greater than much of the timber that is coming into the area from longer hauls. The largest market in the area is for aspen, Douglas-fir and Englemann spruce.

Timing of the project will be very important, with respect to the supply of other timber and fire salvage sales. Other sales may come onto the market at the same time.

In addition to the four mills interviewed in *Table 35, Local Mill Capacity and Current Purchase Price*, there may be a number of small family mills or logging contractors that would be interested in bidding on the timber. Adequate contractors for both the logging and hauling crews, and mills, operate in the local region.

The fuel treatment and restoration project would also have a positive impact on wood industry and logging employment and income. With the influx of timber to the regional mills, the current employment rate of 350 people in Montezuma county, 319 in La Plata county, and 7 in Archuleta county could be sustained for one more year. A typical logging crew employs between 5 and 10 loggers. The income associated with logging activities could range from $15,000 to $25,000 per employee depending on the skill level of the worker for the fuel treatment and restoration period. Mill workers currently are paid approximately $10.00 per hour.

Tourism

It is unlikely the commercial outfitter guides permitted in the area would be significantly impacted due to any of the action alternatives. During treatment or logging activities, the action alternatives may displace some hunters to other areas still within the Pagosa District.

Grazing

None of the action alternatives will significantly change access or use of the current grazing allotments in the long term and all action alternatives are expected to increase forage in the allotment in the long-term. Short term impacts may occur during cutting activities.

Payments to the State

Historically, 25 percent of all timber revenues have been distributed to counties for school and road funding. The 'Secure Rural Schools and Community Self-Determination Act of 2000' allows counties to select a stable annual payment based on the average of the State's high three payments between fiscal year 1986 and fiscal year 1999. This new legislation breaks a 92-year-old link between revenues collected from the sale and use of a variety of national forest products and service and payments to the states. Counties may choose to continue to receive payments under the 25 percent fund, or to receive the county's proportionate share of the state's stable, or full payment amount.

Archuleta County has selected to receive their share of the state's full payment amount. This amount is about $109,000 or 1.8 percent of Colorado's full payment amount. Because the county's payment is greater than $100,000, they are required to reserve 15 to 20 percent of their payment for special projects on federal lands, or county projects. With this new payment process, the actual revenues received by the Forest Service from this project will not directly influence county payments.

Heritage Resources

The section focuses on Heritage Resource issues and details the results of Section 106 compliance efforts conducted in areas earmarked for treatment during project implementation (SJNF Project No. 03-4).

The Kenney Flats Analysis Area contains approximately 15,400 acres. The total area proposed for treatment is 3,826 acres. A variety of treatments are proposed, including

prescribed fire, mechanized mowing and commercial and pre-commercial thinning. The potential adverse effects to heritage resources from these activities include the scorching, charring, or complete consumption of bone and stone artifacts, structural damage, alteration, or consumption of standing, wooden historic era buildings, and the alteration or destruction of potential carbon-dating materials. Post-fire erosion or fire suppression activities within the analysis area could also cause damage to heritage resources.

Management efforts to reduce the potential for stand replacing wildfires in the urban interface, such as mechanical thinning of fuels, and the re-introduction of low-intensity, short duration ground fire, can also help to minimize wildfire damage and contribute to the long-term preservation of both prehistoric and historic archaeological remains.

For the proposed project the Forest Service conducted a Class I file and literature search to obtain information on past Sec. 106 (NHPA) surveys and heritage resources within boundaries of the proposed project. The results of the Class I search revealed that 3,086.1 acres within the proposed analysis area had been previously intensively surveyed (SJNF Project Numbers 13-34, 13-195, 13-209, 13-397, 13-47, 13-482, 13-590A, 13-590B, 13-757, 13-893, 13-894, 13- 1074,13-1075,13-1076,13-1088,13-1228,13-1231, 13-1233, 13-1240, 13-1246, 13- 1248 and 13-1413). Approximately 1,783.8 acres were intensively surveyed last summer by the Pagosa Ranger District heritage resource field crew for a total of 4,869.9 acres (34.5%) being intensively surveyed within the proposed analysis area. The area is characterized as having a low site density based upon the results of this survey, with a density of one site per square mile. Based on this data, it is concluded that this level of intensive sample survey has adequately sampled the proposed project area. Field reconnaissance and topographic map information indicate that 1,944 acres (13.8%) within the proposed analysis area occur in areas with slopes that exceed 35 percent. These are excluded from survey per the terms of the “Programmatic Agreement Among the Advisory Council on Historic Preservation, the Colorado, Wyoming, South Dakota, Nebraska, and Kansas Historic Preservation Offices, and the U.S.D.A. Forest Service, Rocky Mountain Region, Regarding the Implementation of the Prescribed Fire Program.”

Previous surveys within the proposed analysis area have located 22 sites. Of the 22 previously recorded sites, four have been determined as not eligible to the National Register of Historic Places (NRHP), two determined as eligible to the NRHP, and 16 have need data determinations. Both previously recorded eligible sites, and 13 of the 16 need data sites, were relocated and re-evaluated for this project. Site 5AA1731 (AR-O2-13-06-829) has been officially determined as eligible for inclusion in the National Register Of Historic Places under Criterion D of 36-CFR-60.4. Site 5AA550 (AR-O2-13-06-833) has been officially determined as eligible for inclusion in the National Register Of Historic Places under Criterion C of 36-CFR-60.4.

Additional archival research and/or field-testing will be required for previously recorded need data sites 5AA426(AR-02-13-06-14), 5AA553(AR-02-13-06- 31), 5AA554(AR-02-13-06-32), 5AA555(AR-02-13-06-33), 5AA556(AR-02-13-06-34), 5AA825(AR-02-13-06-182), 5AA826(AR-02-13-06-183), 5AA1132(AR-02-13-06-284), 5AA1136(AR-02-13-06-288), 5AA1137(AR-02-13-06-289) before a formal determination of eligibility can be made. Previously recorded need data site 5AA554(AR-02-13-06-32), an obliterated wood constructed railroad trestle, is subsumed under 5AA550.3(AR-02- 13-06-833), a

7.4 mile-long railroad grade segment of the Rio Grande and Pagosa Springs Railroad (5AA550/AR-02-13-06-833).

Two previously recorded need data sites (5AA552/AR-02-13-06-31 and 5AA1131/AR-02-13-06-283) are now located on private property. Previously recorded need data sites 5AA425(AR-02-13-06-13), 5AA427(AR-02-13-06-15) and 5AA827(AR-02-13-06-184) were not relocated for this project. Despite extensive field surveying, these three sparse lithic scatter sites were not relocated. Sites 5AA425, 5AA427 and 5AA827 are recommended as not eligible for inclusion in the National Register of Historic Places.

Previously recorded eligible site 5AA1720(AR-02-13-06-793), a purported CCC checkdam site, was re-evaluated and recommended as not eligible for inclusion in the National Register of Historic Places. Site 5AA1720 was constructed by the Youth Conservation Corps (YCC) in the 1970's for a soil erosion control project (personal communication by Glen Raby, Pagosa Ranger District).

The new 2002 survey located four sites 5AA2406(AR-02-13-06-911), 5AA2407 (AR-02-03-06-909), 5AA2415(AR-02-13-06-912) and 5AA2416(AR-02-13-06-913), inventoried and documented a 7.4 mile-long railroad segment (5AA550.3/AR-02-13-06-833) of the Rio Grande and Pagosa Springs Railroad (5AA550/AR-02-13-06-833) within the proposed project area, and located seven Isolated Finds (5AA2417, 5AA2418, 5AA2419, 5AA2420, 5AA2421, 5AA2422 and 5AA2425). Sites 5AA2406 and 5AA2415 are recommended as eligible for inclusion in the National Register of Historic Places under Criterion D of 36-CFR-60.4. Site 5AA2416 is recommended as not eligible for inclusion in the National Register of Historic Places. The Isolated Finds are not considered eligible for inclusion in the National Register of Historic Places.

Heritage resource mitigation measures are described in Chapter 2. Implementation of these measures will result in no adverse effect to historic properties by the proposed project.

Cumulative Effects

TEMPORAL AND SPATIAL SCOPE

This section considers the effects on the environment resulting from the incremental impact of the alternatives analyzed in detail, when added to other past, present, and reasonably foreseeable actions and trends. These effects are discussed by resource and collectively. Where no cumulative effects have been identified, such is noted.

Past and present actions, and trends, are discussed in detail in Appendix A, Resource History, and throughout the Affected Environment and Environmental Consequences section. Unless otherwise stated, the spatial and temporal scale are the Kenney Flats Analysis Area and 20 years into the future, respectively.

REASONABLY FORESEEABLE FUTURE ACTIONS

In the next 20 years, we anticipate the following occurring in the analysis area:

Continued development on private land;

The ignition of many potential wildfires and actual starting and sustained burning of approximately 10 wildfires;

Suppression actions taken on wildfires, when discovered and suppression forces and equipment are available;

Prescribed burning in the Kenney Flats, Benson Creek and Frio Archuleta areas;

Continued livestock grazing at current levels.

Continued dispersed recreation use and firewood gathering

The cumulative effects of past, present, and the reasonably foreseeable future actions listed above are described below.

Vegetation

Vegetation Cumulative Effects Common to all Alternatives

The effects of predicted private-land clearing, prescribed burning, approximately 10 wildfires under normal conditions, and continued grazing are expected to be minor, having mostly localized impacts at the stand or partial-stand scale. Private-land clearing would have the greatest long-term effect on vegetation, but is expected to occur on such a small scale, relative to the project and/or analysis area, as to be insignificant.

Alternative 1, No Action

The cumulative effects of past management (that is, fire suppression, timber harvest, and livestock grazing) coupled with expected actions, particularly fire suppression, in combination with trends identified within the analysis area, would continue to alter forest stand structure and composition from what was seen historically under a natural-disturbance regime. There would continue to be a lack of ponderosa pine regeneration due to the lack of fire and site preparation. Forested stands would be expected to reflect increasing stand densities, less species diversity, less productive understory vegetation, more canopy closure, and less diversity in age classes. Under extreme fire conditions, larger ponderosa pine would remain at risk from a stand replacement wildfire.

Alternatives 2, 3 and 4

Under these alternatives, the proposed actions would reverse the trends discussed above, however no noticeable change would occur under Alternative 2 until year 15. The combination of thinning and prescribed fire would be expected to increase species diversity and understory vegetation, reduce canopy closure, and add more diversity to age classes. These effects would occur over approximately 3, 857 acres, thus increasing overall vegetative diversity across the Kenney Flats Analysis Area. Combined treatments including future prescribed maintenance burns will also improve opportunities for increasing natural ponderosa pine regeneration.

Fire

Alternative 1, No Action

During extreme fire conditions, continuing existing dense stand structure conditions during a wildfire event could result in a large amount of stand replacement crown fire.

Alternative 2

Under extreme fire conditions, should a wildlfire occur following initial thinning and prior to prescribed burning, given the increased fuel loading, a stand replacement fire could

result. Due to the incremental nature of thinning and prescribed burning under this alternative, fire behavior would not be appreciably changed until year 15.

Alternatives 3 and 4

For the areas treated (thinned and prescribed burned) an immediate change in fire behavior would be anticipated. During a wildfire event it is anticipated there would be more low intensity ground fire and less acres consumed by crown fire compared to Alternatives 1 and Alternative 2 until year 15.

Air Quality

No cumulative effects on air quality were identified during the analysis.

Soils

No cumulative soil effects were identified during the analysis.

Watershed

Spatial Scope of Analysis

The spatial scope of the watershed cumulative-effects analysis encompasses the five watersheds including Lower Rio Blanco, Middle Rio Blanco, Halfway Canyon, Coyote Creek, and Little Navajo River.

Cumulative Effects

The SJNF procedure to assess cumulative watershed effects uses information from field evaluation of watersheds, stream channel conditions, and a modified map analysis process (SJNF, 1996, Smith, 2003). The map analysis process is a risk assessment, and does not project probable physical or geomorphic effects. It also does not assess or model physical processes, such as sediment or water yields. It is designed to be conservative and minimize the possibility of erroneously or prematurely concluding that cumulative effects are of no concern in a watershed or analysis area.

A screening phase (Phase 2 Cumulative Effects Analysis) was completed for all watersheds. Past, present, and near-future activities were evaluated for their potential to impact a watershed. If the percentage of all activities assigned a high level of risk to watersheds is less than 20%, the probability of adverse cumulative watershed effects is assumed to be minimal without further analysis. If the percent of high disturbance of the watershed is greater than 20%, then further analysis of the terrain on which the activities occur is necessary.

Land management activities that have occurred in the Kenney Flats cumulative effects area were assessed, based on their potential for disturbance of the watershed. Timber harvest, road construction, and livestock grazing were the primary disturbance activities.

Past timber harvest activities that are assigned a high level of disturbance include conifer partial cuts that have occurred within the last 10 years that are followed by prescribed fire/underburning. All forest restoration activity and new construction or reconstruction of roads proposed for action Alternatives 2, 3 and 4 were included in the analysis as high disturbance activities. Existing roads were considered a permanent high-level disturbance unless closed, covered with vegetation, and properly drained. Grazing is also considered a high level of disturbance when utilization exceeds 50%. Areas in which there is residential development on lots less than one-acre in size are

considered a high level of disturbance, however, all residential development within the analysis area consists of lots greater than one-acre in size.

All action alternatives involve treatments occurring at various intervals over the 20 year temporal scale of the project. Some of the activities identified are assigned a high level of disturbance that continues for a period of time ranging from five to 20 years and are therefore carried forward into subsequent time periods. Table 37 displays the results of this analysis.

Table 3.5-10: Summary of Cumulative-Effects High Disturbance Areas and Percent of Watersheds Affected

YEAR 1-5	Watershed																			
High Disturbance Activity (acres disturbed)	Coyote Creek				Middle Rio Blanco				Little Navajo River				Lower Rio Blanco				Halfway Canyon			
Acres in Watershed	**28,754**				**19,632**				**15,025**				**11,711**				**4,057**			
	Alt1	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**
Proposed Action (need by alternative)	0	0	864	1640	0	0	0	0	0	0	0	7	0	0	81	534	0	0	510	1034
Historic Timber harvest (6-10 year recovery)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All existing roads	484	484	484	484	249	249	249	249	172	172	172	172	200	200	200	200	108	108	108	108
Primary/secondary range exceeding 50% utilization	360	360	360	360	0	0	0	0	0	0	0	0	0	0	0	0	20	20	20	20
Interface areas (homes on lots < 1acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent of watershed affected by high-disturbance activities	**3%**	**3%**	**6%**	**9%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**2%**	**2%**	**2%**	**6%**	**3%**	**3%**	**16%**	**29%**
YEAR 6-10	Watershed																			
High Disturbance Activity (acres disturbed)	Coyote Creek				Middle Rio Blanco				Little Navajo River				Lower Rio Blanco				Halfway Canyon			
Acres in Watershed																				
	Alt1	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**
Proposed Action (need by alternative)	0	0	864	1640	0	0	0	0	0	0	0	7	0	0	534	534	0	0	789	1034
Historic Timber harvest (6-10 year recovery)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All existing roads	484	484	484	484	249	249	249	249	172	172	172	172	200	200	200	200	108	108	108	108
Primary/secondary range exceeding 50% utilization	360	360	360	360	0	0	0	0	0	0	0	0	0	0	0	0	20	20	20	20
Interface areas (homes on lots < 1acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent of watershed affected by high-disturbance activities	**3%**	**3%**	**6%**	**9%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**2%**	**2%**	**6%**	**6%**	**3%**	**3%**	**23%**	**29%**
YEAR 11-15	Watershed																			
High Disturbance Activity (acres disturbed)	Coyote Creek				Middle Rio Blanco				Little Navajo River				Lower Rio Blanco				Halfway Canyon			
Acres in Watershed																				
	Alt1	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**
Proposed Action (need by alternative)	0	0	482	0	0	0	0	0	0	0	7	0	0	0	453	0	0	0	279	0
Historic Timber harvest (6-10 year recovery)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All existing roads	484	484	484	484	249	249	249	249	172	172	172	172	200	200	200	200	108	108	108	108
Primary/secondary range exceeding 50% utilization	360	360	360	360	0	0	0	0	0	0	0	0	0	0	0	0	20	20	20	20
Interface areas (homes on lots < 1acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent of watershed affected by high-disturbance activities	**3%**	**3%**	**5%**	**3%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**2%**	**2%**	**6%**	**2%**	**3%**	**3%**	**10%**	**3%**
YEAR 16--20	Watershed																			
High Disturbance Activity (acres disturbed)	Coyote Creek				Middle Rio Blanco				Little Navajo River				Lower Rio Blanco				Halfway Canyon			
Acres in Watershed																				
	Alt1	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**	**Alt1**	**Alt2**	**Alt3**	**Alt4**
Proposed Action (need by alternative)	0	0	776	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	453	0
Historic Timber harvest (6-10 year recovery)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All existing roads	484	484	484	484	249	249	249	249	172	172	172	172	200	200	200	200	108	108	108	108
Primary/secondary range exceeding 50% utilization	360	360	360	360	0	0	0	0	0	0	0	0	0	0	0	0	20	20	20	20
Interface areas (homes on lots < 1acre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent of watershed affected by high-disturbance activities	**3%**	**3%**	**6%**	**3%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**1%**	**2%**	**2%**	**2%**	**2%**	**3%**	**3%**	**14%**	**3%**

Table 28: Summary of Cumulative Effects High Disturbance Areas and Percent of Watersheds Affected

Cumulative-Effects Summary and Rationale

When all the past, present, and near-future activities in the watersheds are accounted for, the results of the above analysis process support the conclusion that cumulative watershed effects are minimal in four out of the five watersheds. The predominant cumulative effects occur in Halfway Canyon due to its small size. Halfway Canyon is the smallest of the watersheds within the analysis area with a watershed area of 4,057 acres, and because of its size it exceeds the 20% cumulative disturbance threshold under Alternative 3 in the years 6 through 10 by 3%. Alternative 4 completes all identified treatment units in the first five years, impacting 1,393 acres in the Halfway Canyon watershed (including new and reconstructed roads). Combined with effects from existing roads and grazing, 29% of the Halfway Canyon watershed is affected, and the impact is carried through the analysis for the first 10 years.

Further analysis of the treatment units in Halfway Canyon shows that the areas where treatment is proposed are located on relatively flat terrain (ranging from 0 to 25% slopes) with slight to moderate erosion potential.

Halfway Canyon and Spiler Canyon are at least 100 feet, if not more, from the proposed treatment areas with the exception of Treatment Area 4. Treatment Area 4 bisects Halfway Canyon for a distance of approximately 1,000 feet. Mitigation requirements dictate that a “no equipment” buffer zone of 100 feet on each side of a perennial stream will be maintained. Additionally, Treatment Area 4 is located within a slight to moderate erosion potential soil unit with slope ranging from 4 to 25%. Therefore, cumulative watershed effects are expected to be minimal in the Halfway Canyon watershed under any of the action alternatives.

Watershed Conservation Practices Handbook practices listed under Section 2.9.2 will be required in all five watersheds to reduce the potential impacts associated with all action alternatives.

Aquatic Resources

There will be no cumulative effects to the SJNF Management Indicator Species in the Blanco River as a result of the proposed project. There are no Colorado River Cutthroat Trout within the area of influence of the analysis area. Consequently, there are no cumulative effects predicted for CRCT.

Range

Alternative 1

The cumulative effects of fire suppression over the past 100 years and past timber harvest activities have produced stands that are denser, with higher canopy closure. This has reduced the amount of forage production in the understory of many ponderosa pine and warm-dry mixed conifer stands. Under Alternative 1, this trend would continue.

Alternatives 2, 3, and 4

Under these alternatives, the cumulative effects of fuels reduction activities and prescribed burning would decrease stand density and canopy closure in ponderosa pine and warm-dry mixed conifer, thus increasing forage production in secondary range areas over the next 20 years. In the long term (100+ years), forage production would be maintained in secondary range if the area were burned periodically (once every 10–20 years).

Wildlife: Management Indicator species

Past, present, and reasonable foreseeable future activities within the analysis area are identified in the land use history section. The cumulative effects from these activities when combined with the proposed action have and will continue to influence habitat for MIS in the analysis area.

Past and present activities such as timber harvest, livestock grazing, and fire suppression have affected stand structure and diversity within the ponderosa pine, shrub/Gambel oak and warm-dry mixed conifer forest types. As a result, the habitat conditions we see today are atypical of stands present during pre-settlement periods. Current forest conditions consisting of even aged stands with increased densities, increased shrub understories, and the lack of large trees has reduced habitat quality and quantity for MIS. These conditions have influenced the forests resilience to disturbances such as wildfire, insects, and disease. These corresponding influences may adversely impact wildlife habitat and populations depending on the degree at which they occur.

Proposed ponderosa pine restoration treatments are designed to shift the atypical stand structures described previously into stand structures resembling those found during pre-settlement periods. Stand structures that will be present post-treatment include a more uneven aged stand condition, forests that are open and park-like, stands that have clumpy distributions of trees in all age classes, and over time, an increasing presence of large (yellow-bark) trees present across the landscape. As documented in the literature, these stand structures provide ideal habitat for many native wildlife species including the MIS for this analysis.

As proposed treatments are implemented across the landscape we expect to see numerous benefits to MIS and their habitats in the short and long-term. Over time we also expect to see shifts from stable or decreasing habitat trends to upward habitat trends. Additionally, we anticipate that habitat trend will correlate with population trend for MIS such as Abert's squirrel, hairy woodpecker, and mountain bluebird. We also recognize that actions such as restoration treatments may not directly result in positive impacts to some species. A species such as the green tailed towhee thrives in shrubland habitats and therefore responds positively to these atypical habitat conditions. Treatment

will not result in broadscale impacts to shrubland habitats as this habitat type is in excess across the Forest. Treatments will maintain the structural diversity of shrubland habitats over time, and therefore habitat and population trends are likely to remain stable. For some species such as elk, there is no correlation between habitat trends and population trends from land management actions, but recognize that human influences can and will affect distribution.

In summary, although some natural processes have been altered relative to frequency and extent (e.g., wildfire), past and present activities have not eliminated any ecological processes in the analysis area. The proposed action is designed to reverse habitat trends and effects to MIS from the atypical stand structures in the analysis area resulting in long-term beneficial impacts to wildlife. Consequently, over time, the proposed action will result in a positive cumulative effect to MIS and other wildlife.

Cumulative effects analyses for federally listed threatened and endangered species are disclosed in the Biological Assessment, and in the Biological Evaluation for Forest Service sensitive species. There were no cumulative effects identified for threatened or endangered species. Cumulative effects for sensitive species are that same as those listed for MIS.

Transportation

No cumulative effects on transportation were identified during the analysis.

Recreation

No cumulative effects on recreation were identified during the analysis.

Land Use

No cumulative effects on land use were identified during the analysis.

Visual Resources

No cumulative effects on visual resources were identified during the analysis.

Socioeconomics

No cumulative effects on the South San Juan roadless areas were identified during the analysis.

No economic cumulative effects were identified during the analysis.

Heritage Resources

No cumulative effects on heritage resources were identified during the analysis.

Wildfire Resource Effects

Vegetation

Alternative 1 No Action

Ponderosa Pine

Under normal conditions, a wildfire would most likely remain a surface fire, with occasional torching of individual trees or small clumps of trees. The fire scenario

discussed in Appendix G showed 119 acres of surface fire and 0 acres of stand-replacement fire for Alternative 1, under the normal fire scenario.

The Gambel oak in the understory of the pine stands would act as a ladder fuel and perhaps contribute to torching of overstory trees. Surface fire would kill the aboveground portion of some oak, which would stimulate sprouting, creating a younger age class of oak in these stands.

In areas where surface fires consumed enough duff and litter to expose mineral soil, ponderosa pine regeneration would be encouraged. Fuel loading would be decreased in areas that experienced surface fires. Aspen would also be stimulated to sprout if fires occurred where aspen was present as inclusions in the pine stands.

Under extreme conditions, the existing fuel loading and ladder fuels make it much more probable that a surface fire would transition to a stand-replacement fire. The amount of area burned would also be greater under extreme conditions. Appendix G shows 3,709 acres of surface fire and 1,826 acres of stand-replacement fire for Alternative 1, under the extreme fire scenario.

Overall, there would be approximately 2,000 more total acres burned under extreme conditions in Alternative 1 than under the same conditions in either Alternatives 2, 3, or 4. There would be three times more stand-replacement fire acres bruned under this alternative (1,826 ac.) than in either Alternatives 2, 3 or 4 (ranges from 610 – 637 acres. A stand-replacement fire would be more destructive than surface fires, causing widespread mortality of overstory trees inlcuding pre-settlement trees and setting back succession to a stage where shrubs and herbaceous vegetation dominate in many areas. These areas would remain dominated by shrubs and herbaceous vegetation for at least the next 20 years, since most seed trees would have been destroyed by fire, and Gambel oak.

It is difficult to predict how long it would take ponderosa pines to re-establish on a site that has experienced high-intensity fire, since the amount of regeneration would depend on numerous factors, including location of seed trees, aspect, weather, and competition from other species that initially colonized the site. Ponderosa pine historically developed with a fire regime of frequent, low-intensity fires. Stand-replacement fires are outside the historic range of variability (HRV) of fire behavior in this cover type in the Southwest.

Alternatives 2, 3 and 4

Ponderosa Pine

If a fire were to occur under either of these alternatives in a normal year, it would probably remain a surface fire, with occasional torching of individual trees or small clumps of trees. There would be less vertical continuity of fuels in pine stands that were prescribed burned, so there would likely be fewer trees or clumps of trees susceptible to torching. In stands that were not been burned, vertical continuity would remain the same as discussed under Alternative 1.

During an extreme year, six times the amount of area would burn as in a normal year. As the fire modeling shows, however, with the fuel treatments prescribed under these alternatives, far fewer acres would burn under these alternative (3,301-3,541 acres) than under the No Action Alternative (5,535 acres). This scenario showed between 610 and

637 acres of the analysis area being involved in a stand-replacement fire under these alternatives, as opposed to 1,826 acres under the No Action Alternative.

Specifically for the ponderosa pine cover type, stands that burned would probably experience only surface fires, since stand density, fuel loading, and horizontal and vertical fuel continuity would be reduced by the thinning and burning treatments. Unburned stands would be more susceptible to stand-replacement fires, since fuel loading and vertical continuity of fuels would be greater.

The thinnings and burning treatments proposed under these alternatives would create conditions in which fire behavior would remain within the historic range of variability for this ponderosa pine stand.

Soils

Alternative 1 No Action

Given the fire scenario under normal conditions, some localized soil heating and/or soil exposure (consumption of surface duff) could result in soil erosion when precipitation occurred post-fire, especially where fuel concentrations existed before the burn. There would probably be some soil erosion where stand-replacement fire occurred, due to the lack of overstory vegetation. Erosion would be greatest during hard rains (as during normal, late-summer, monsoonal events) or during snowmelt and spring runoff.

Given the extreme fire scenario, the effects of soil movement would be much greater. More extreme heating, to the point of complete consumption of duff and making soils hydrophobic, would be expected, leading to excess runoff, surface erosion, and channel cutting. The three-fold increase in stand-replacement fire, compared with the action alternatives, would result in drastically increased soil erosion and sedimentation into adjacent stream courses.

Wildfires resulting in a high burn severity can have a number of direct negative impacts on the soil resource. At high severity levels, litter and duff are consumed thereby removing ground cover and soil temperatures vaporize soil organic materials resulting in a waxy layer and a "sealed" soil surface. This surface is subject to decreased water infiltration, increased runoff and, when combined with a loss of vegetation cover, increased soil erosion.

Duff layers, which serve as a reservoir of nutrients and supply such to the soil through the decomposition process, can also be negatively affected or eliminated as a result of moderate and high severity burns, respectively, thereby limiting future nutrient concentrations. Similarly, the loss of woody debris in a high intensity fire will also reduce the input of nutrients into the soil over the long term (USDA Forest Service 2001b). Nitrogen and sulfur are two important plant nutrients that can potentially limit plant growth when in low concentrations in the soil. Both of these nutrients have low volatilization temperatures and are subject to loss from the soil resource as a result of a fire event. It can be assumed that, in the case of severely burned areas, nitrogen and sulfur soil concentrations will be lowered resulting in a reduction in soil productivity (USDA Forest Service 2001a). This analysis also applies to phosphorus soil concentrations (USDA Forest Service 2001b).

Soil microorganisms (including mychorrizae fungi) enhance the plant uptake of nutrients and water in droughty, infertile soils, improve drought resistance, and protect plants against pathogens in addition to a number of other positive benefits. Where soil temperatures reach or exceed lethality, microorganism populations are lost in the short-term and soil productivity is reduced (USDA Forest Service 2001b).

Alternatives 2, 3 and 4

Effects would be very similar to those discussed above for Alternative 1, in normal conditions. There would be slightly less erosion, due to slightly less stand-replacement fire, than in Alternative 1.

There would be dramatically less soil erosion under the extreme fire scenario, due to both the fraction (i.e., one-third) of area undergoing stand-replacement fire and the accompanying much reduced area of surface fire.

Watershed

Under No Action Alternative 1 under the extreme fire scenario, a wildfire would likely result in a high burn severity and would likely have a number of direct negative impacts on watershed resources. At high intensity levels, litter and duff are consumed thereby removing ground cover and soil temperatures vaporize soil organic materials resulting in a waxy layer and a "sealed" soil surface.

Peak flows from short duration, high intensity rainstorms can increase several times what they were under unburned conditions. This leads to downstream flooding, as well as channel scour and deposition. Debris flows can also be initiated causing dramatic changes in channel morphology. Water quality can also be affected with impacts being carried miles downstream of the fire.

Alternatives 2, 3 and 4 would reduce vegetation densities. This would reduce the risk of larger, high-severity wildfires, compared with the No Action alternative. High-severity burns as that modeled under extreme fire conditions under no action, occurring over a large area would have the highest potential to cause unwanted watershed impacts. These impacts can include increased erosion rates, increased runoff, increased stream sedimentation and increased landslide activity.

Range

Alternative 1

If a fire occurred under normal conditions, there would be only a small, short-term change in the amount of forage available, since the fire would be of fairly low intensity. A fire burning under extreme conditions would burn a much larger area, with greater intensity, and would increase forage production over a larger area and for a longer time.

Alternatives 2, 3 and 4

The effects of fire under normal conditions would the same as those described under Alternative 1. If a fire burned under extreme conditions under any of these alternatives, it would not be as intense and would not burn as much area, compared with Alternative 1. Hence there would not be as much of an increase in forage for as long a period, compared with Alternative 1.

Wildlife

Under normal fire conditions, given the mobility of the Management Indicator Species (MIS) analyzed for this project, it is unlikely any of these species would suffer meaningful reductions in numbers in the analysis area during a wildfire. Under extreme fire conditions, however, depending on the rate of fire spread, some wildlife may not have the ability to escape and survive. Not knowing the specific spread rate, it would be speculative to make any prediction on numbers or types of wildlife that might be lost in such an event. More predictable, based on the normal- and extreme-fire scenarios, are the impacts on habitat within the analysis area under the various alternatives analyzed in detail. Such a discussion follows.

Alternative 1

If a wildfire were to occur in the analysis area under normal conditions, it would most likely remain a surface fire, with occasional torching of individual trees or small clumps of trees in ponderosa pine. Surface fire and occasional torching of overstory and mid-canopy trees would add to the diversity across the landscape. Structural attributes affected would primarily include snags and downed logs. The resulting burn pattern would probably be somewhat patchy, therefore there should be no major impacts on understory or overstory vegetative structure.

A wildfire under normal conditions would have both positive and negative impacts on habitat. Surface fires in ponderosa pine would kill the aboveground portion of oak, stimulating sprouting and creating a younger age class of oak in the stand. Burning of oak would likely improve browse for deer and elk, and reduce a small component of cover for big game,. Where surface fires consumed enough duff and litter to expose mineral soil, ponderosa pine regeneration would be encouraged, benefiting Abert's squirrels.

The torching of individual or small clumps of trees would increase snag availability, but habitat value would depend on the intensity and degree of burning. Trees that burn with high intensity and are mostly consumed would probably not remain standing very long, compared with trees in which only a portion of the crown burns, thus are likely to remain standing longer.

In extreme conditions, the existing fuel loading and ladder fuels make it much more likely that a surface fire would transition to a stand-replacement fire. Such a fire would be more destructive to vegetation than a surface fire, causing widespread mortality of mid-canopy and overstory trees and setting back succession to a stage where shrubs and herbaceous vegetation dominate in many areas.

The resulting effects would be a loss of thermal cover for big game, and loss of foraging and nesting habitat for Abert's squirrel. Burned areas would be dominated by shrubs for at least 20 years (longer in cool-moist mixed conifer and spruce-fir), since most seed trees would have been destroyed. Snag availability would increase for cavity nesters, and it is probable that bark beetles would increase, as they take advantage of weak and dying trees.

Alternatives 2, 3 and 4

If a wildfire were to occur under this alternative in a normal year, it would most likely remain a surface fire, with occasional torching of individual trees or small clumps of trees. The effects on MIS and habitat would be similar to those described under the No Action alternative.

Under extreme conditions, a wildfire's effects on MIS and habitat would be much less than those described under the No Action Alternative. Specifically, for areas that had been thinned and subsequently prescribed burned, there would be a reduction of fuel loading and vertical- and horizontal-fuel continuity, thus it is less probable that a surface fire would transition into a stand-replacement fire leaving habitat essentially intact.

Fisheries

Alternative 1

A wildfire under normal conditions would probably remain on the surface, or could occasionally torch individual trees or clumps of them. Under this scenario, no adverse impacts are likely to occur on fisheries adjacent the analysis area, because the overstory would not be significantly affected, nor would forest floor vegetation.

Under extreme conditions, a surface fire would transition to a stand-replacement fire and could eventually lead to a stand-replacement event, affecting large, contiguous blocks of forest habitat. Loss of the overstory, combined with significant loss of duff and litter layers, could result in increased water and sediment yield, and affect fisheries and streams adjacent the analysis area causing changes in flow regime sediment deposition, in-channel woody debris, impaired movement from channel blockage, and changes in water temperature, significantly impacting the fisheries in these areas.

Alternatives 2, 3 and 4

If a wildfire were to burn under normal conditions, its effects on the analysis area fisheries are expected to be the same as those described under Alternative 1. If a wildfire were to burn under extreme conditions, the adverse effects depicted under Alternative 1 would likely be greatly reduced.

Transportation

Under the no action extreme-fire scenario, transportation routes could be affected by erosion and channel cutting, resulting from post-fire heavy precipitation or runoff events. Ditches and culverts would be expected to plug up, with some resultant cutting of road surfaces by diverted water. Impacts to transportation routes would likely be greatly reduced under the extreme scenario under all action alternatives.

Recreation

Under the no action extreme-fire scenario, given the above effects on transportation, some recreation use would likely be curtailed, due to closed or impassable roads. Also, where stand-replacement fire occurred, we expect that recreational users of those areas, especially hunters, and outfitter-guides and their clients, would be displaced. Some displacement would be short term, until vegetation recovered. Other displacement would last much longer, where many of the standing, dead trees fell and made overland travel

extremely difficult. Impacts to recreation would likely be greatly reduced under the extreme scenario under all action alternatives.

Land Use

Under Alternative 1 (No Action), in an extreme-fire-behavior year, the risk of a destructive wildfire affecting private property would be considerably higher than under Alternatives 2, 3 or 4. Under Alternative 1, there would be no treatments to reduce fuel continuity or loading, and the forest would become denser. Suppression options under the No Action alternative would be very limited, compared with those available under Alternatives 2, 3 or 4.

Following forest thinning and prescribed-fire actions under Alternative 2, 3 or 4, a wildfire ignition in this area is much more likely to progress as a low-intensity ground fire, with minor amounts of stand-replacement fire. Such a fire allows for the use of much more effective suppression techniques, compared with the high-intensity crown/surface fire combination predicted under Alternative 1.

Visual Resources

Stand-replacing fire under Alternative 1 could significantly degrade the area's visual character, particularly in any areas next to open roads in the analysis area.

Heritage Resources

Given the small number of existing sites, no wildfire effects under any of the alternatives are anticipated.

Economics

There would be little difference between the No Action and action alternatives, given a fire under normal conditions. A fire under extreme conditions, under the No Action Alternative, could have adverse impacts on property values for private landowners in the vicinity and could adversely affect permittees in the short term whose permitted area undergoes stand-replacement fire.

We assume that the costs of repairing and/or maintaining transportation facilities, as well as the costs of suppression and rehabilitation, would be drastically higher under the No Action Alternative, given the extreme-fire scenario.